

LETTERS AND PAPERS

O N

Agriculture, Planting, &c.

ADDRESSED

The SOCIETY instituted at BATH,

FOR THE ENCOURAGEMENT OF

Agriculture, Arts, Manufactures, and Commerce,

Within the Counties of Somerset, Wilts, Gloucester, and
Dorset, and the City and County of Bristol.

VOLUME III.

LETTERS AND PAPERS

O N

Agriculture, Planting, &c.

SELECTED FROM

THE CORRESPONDENCE-BOOK

O F T H E

SOCIETY INSTITUTED AT BATH,

FOR THE ENCOURAGEMENT OF

AGRICULTURE,
ARTS,

||

MANUFACTURES,
And COMMERCE,

WITHIN THE COUNTIES OF

SOMERSET,
WILTS,

||

GLOCESTER,
And DORSET,

A N D

THE CITY AND COUNTY OF BRISTOL.

VOL. III.

T H I R D E D I T I O N .

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M DCC XCI.

T O

THE RIGHT HONOURABLE

THE EARL OF AILESBUURY,

A S

PRESIDENT OF THE BATH SOCIETY,

A N D A

GENEROUS PATRON OF AGRICULTURE

AND THE USEFUL ARTS.

THIS THIRD VOLUME OF THE SOCIETY'S

SELECT PAPERS

IS MOST RESPECTFULLY INSCRIBED.

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The Plate of Mr. Dobson's Model of a Barn, to face p. 335.
The Plate of Mr. Winlaw's Patent Mill, for separating the Grain from
the Ears in place of Threshing, to face p. 371.

INTRODUCTION.

THE very favourable reception which the two former Volumes of Select Papers met with, has induced the Society to lay a *Third* Volume before the Publick, which they trust will be found in no respect less interesting.

For this they are happy in acknowledging their obligations to many respectable Correspondents, who, by their valuable communications, have given the strongest proof that the exertions of the Bath Society to promote the interests of Agriculture, and the useful Arts, have met with their approbation.

In revising the following Letters for the Press, such parts as were complimentary to
the

LETTERS

TO THE

BATH AND WEST OF ENGLAND AGRICULTURE SOCIETY.

ARTICLE I.

On the Farm-Yard Management of Dung.

[By ARTHUR YOUNG, esq.]

GENTLEMEN,

DURING my residence at North-Mims, in Hertfordshire, I kept a register of a great number of experiments and observations, which I intended afterwards to revise and publish: but in this I did wrong; for such minutes should be published while they are yet fresh in the memory, that the observations and conclusions drawn from them may be founded not only on the direct circumstances of the trial, but on the general colour of the seasons, and situation and nature of the farm. On quitting it, I went directly to Ireland;

and from that time till I settled in Suffolk had no time to look over those papers, some of which were lost in moving.

But on examining them lately, I find a series of minutes of the Farm-yard management, which I think ought not to be destroyed, as they contain an attempt to ascertain the expence of that manure, which has not, at least to my knowledge, yet been done; being indeed a very difficult and complex, though interesting, question.

I shall premise, that I insert this account exactly as written at the time, and not as a general essay on the subject, to contain the whole of my opinion formed on succeeding experience, as well as on that which is here noted.

I.

The Manure raised in the Farm-Yard during the Winter 1768-9.

My stock of cattle this winter was, six horses, four cows, and nine lean hogs.

The straw, &c. for making into dung, was, thirteen acres of wheat, and twelve of oats, besides which I bought eight loads of straw, and three of haulm.

I calculate

I calculate that the 25 acres of corn yielded 18 loads of straw. The whole therefore was 29 loads. The cows and horses consumed 16 loads of hay.

The cows and stock-swine ran loose in the yard, and had their straw given in cribs; the stables and fat hog sties were cleaned into the yard. In May, the whole was turned over and laid into square heaps; and in June carted away. The quantity 118 loads, each 36 bushels, which is the quantity made by 45 loads of hay and straw, which is near $2\frac{3}{4}$ loads of dung for one of hay or straw, and 12 loads a head for the horses and cows.

EXPENSES.

	£.	s.	d.
8 loads of straw, (average 13s. 1d. per load)	5	5	3
3 loads of haulm —————	1	5	8
18 loads of straw —————	11	15	6
Labour in shovelling up the dung, and			
turning it over —————	0	12	0
	£.	18	18 2

From hence it appears, that had the straw been bought merely to litter cattle with, the dung so raised would have cost 3s. 2d. per load of 36 bushels. Considering that it is on the spot, and no expence therefore of carriage in bringing it, this price I

think is not dear. I would certainly buy dung so to have it delivered at my farm. But this is not the point of view in which the 18l. 18s. 2d. should be considered; for four cows were partly wintered out of it: They ate straw the whole winter, besides their hay; this is to be reckoned at 6d. a week, or 2l. 12s. which reduces the 18l. 18s. 2d. to 16l. 6s. 2d. which is 2s. 9d. per load;—a price cheaper than dung can be had in any other method.

II.

The Manure raised in the Farm-Yard during the Winter 1769-70.

This year the stock of cattle was 7 horses, 7 cows, 3 calves, besides hogs. The straw, fern, and stubble, for making into dung, was 67 loads, viz.

11 waggon loads of fern

16 loads of straw bought

30 ditto, the product of $33\frac{1}{2}$ acres of spring corn

10 waggon loads of stubble, bought at 7s.

And 22 loads of hay consumed by the horses, cows, &c.

I altered my management this year; for in August, September, and October, I carted in 591 loads, 18 bushels each, of turf and ditch earth, which were spread over the yard, about 2 feet deep, except round against the buildings to the breadth of 6 or 7 feet, which was left as a path. On this
bed

bed of earth the stables, cow-house, hog-sties, &c. were cleansed; and the cribs with straw for the loose cattle were moved about it.

My design in carting this earth was to retain the urine; a small gutter which runs into a neighbouring horse-pond drains the yard: the situation is such, that I could not stop it in the way to make any use of it; and as rain will always make the farm-yard overflow, which occasions an absolute necessity to give it an outlet, I was desirous of straining it well through this layer of turf, &c. which I apprehended would retain much of the virtue of the water before it ran off. With this intention, I formed two small holes on the side of the compost for the water to drain into, and I made one of my people very often throw up all the water from those holes unto the dunghill, until no more would drain in for the present; this was repeated many times every week, especially when the weather was dry, as then the virtue of the water is so much the greater; the colour of it also is a good indication of the proper time to perform this operation.

Several gentlemen, to whom I have mentioned this method of proceeding, have objected, that I increase the size of my dunghill without adding to its virtue—that 100 loads of pure dung are far

better than 100 loads of dung and earth mixed—that I greatly increase the expence of carriage; and that the more you reduce manure to its essence, the better.

With submission, I differ from them in every particular. The enquiry is not whether 100 loads of dung be better than 100 loads of my compost, but whether it be better than the same quantity of dung mixed with 50 loads of earth in the manner I have mentioned.

Let it be considered, that the dung, as it is commonly managed, has its virtue washed through without any other substance being ready to receive it. Therefore, the point in question is, the addition which I make to my dunghill by retaining so much of the urine, and the washing of the dung; it is not the mere comparison of the dung and earth, though I should be inclined to the practice, if that only were the case; but it is the addition which I gain of urine. When the whole compost is mixed together, it is not mere earth that is under the dung, but a body replete with riches; turf, earth, &c. quite saturated with urine, and all those particles which rain, &c. carry through dunghills; the mixing these bodies together renders the whole mass nearly of equal goodness: on some soils it undoubtedly

undoubtedly is as good, and particularly on mine; for spread the effence of dung, which these gentlemen are so fond of, and it is washed through our gravels in one season; a top-dressing of foot, pigeon's dung, &c. lasts but one crop; and very rotten pure dung ranks much in the same manner. With such a compost as I recommend, the case is different.

I have some binding pebbly loams, that have so strong an adhesion, as to be what the farmers justly call most *unkindly land*; for it has the tenacity of clay without any of its virtues. Small quantities of dressings, however rich, are of little benefit on these soils; a pound of the effence of dung would be so fast locked up in a large clod, as to be rendered totally useless for a whole season: a rich top-dressing of foot, &c. is oftentimes quite lost on such land. For this reason, nothing does so well with it as composts not kept long, carried on in very large quantities. I would not give 20s. for twenty loads carried on to an acre, though I would give 3l. for forty loads; there must be quantity enough to keep the clods and loose earth from uniting, or else the dunging is of little service. I need not add of what consequence a strong fermentation, completed in the soil, must be to this land; but small quantities, however rich, raise no fermentation. The
richer

richer the dung, according to the ideas of these gentlemen, the less the fermentation. This is an argument in favour of *quantity*, for the yard compost (unless for meadow ground, which is an exception to this reasoning, from the difficulty of entrance into the soil) should be carried on to the land, and ploughed in while in full fermentation, which is before its quantity is much diminished. Let it however be remembered, that this reasoning is here applied particularly to the soils in question; there are others in which it would not be proper.

As to carriage being increased; farmers form composts of earth and dung, *stratum super stratum*, a practice extremely common; the expence is the same as in my method, only by making the heap in my yard, I have the advantage of retaining the urine, &c. in the manner of which I have spoken.

The compost became by the middle of May of an uncommon size for so small a farm as mine, (only 97 acres) it was in several parts six feet thick, and in all four or five. I then set about turning it over, and mixing it well together; in doing this, I agreed with four labourers to perform that operation, and also to cart it into the fields, and spread it on the land, I finding them two three-wheeled carts and a horse; and they to receive for the whole
job

job a guinea per hundred loads; the carts hold 18 bushels. It was accordingly done, and the quantity was 1106 loads.

In the turning it over, they pursued the method common in this country, of keeping an open trench through the heap, and throwing into that all the earth, and much of the dung, which is there cut in pieces before it is thrown up on that part of the heap that is finished; attention being given to mix the earth and dung well together.

Total	—	—	1106 loads
Deduct	—	—	591
Remain	—	—	<u>515</u>

Which is near six of dung for each of hay, straw, &c. Last year the proportion was $2\frac{3}{4}$ at 36 bushels each, so that the quantity this year exceeds; but then the cabbages eaten in the yard are not included, which would reduce it something. For horses and cows it is 79 loads each.

E X P E N C E S.

	£.	s.	d.
Carting 591 loads of earth into yard	3	16	10
Team, &c. at $\frac{1}{4}$ d. a load.	—	1	17 0
11 loads of fern at 6s.	—	3	6 0
One man 6 days	—	0	7 0
Team and repairs 6 days, at 10s. 3d.	3	1	6
Carried over	£.12	9	4

	Brought over	£.12	9	4
10 loads of stubble at 7s. (the price of the stubble and the chopping)		3	10	0
Two men at ditto 4 days	—	0	5	4
Team, &c. ditto at 10s. 3d.	—	2	1	0
16 loads of straw at 12s. 5d.	—	9	19	0
30 ditto at 12s. 5d.	—	18	12	6
Labour in shovelling and throwing up water	—	0	17	0

[The guinea per 100 loads, for turning, filling, carting, and spreading, is $2\frac{1}{2}$ d. per load, which is thus divided,

Turning over	-	0	0	$0\frac{3}{4}$
Filling and carting	·	0	0	$1\frac{1}{2}$
Spreading	- -	0	0	$0\frac{1}{4}$
		0	0	$2\frac{1}{2}$

Of this only the turning is to be charged here; it is

	—	3	9	1
Total	£.51	2	4	

[I should explain, that the expence of the team, and the wear and tear of carts, waggons, and harness, are throughout these minutes reckoned at what they actually cost: at the end of every year the expence incurred was proportionably divided among the work done, according to the strength, labour, wear, and other circumstances. This is the only minutely accurate way of knowing the real expence of work; it proceeds on the principle, that if two horses cost 20l. and they plough 20 acres in the year, doing no other work, the expence is 20s. an acre. Those men who have their teams idle to save expence, know very little of what their real expence is.]

But from hence must deduct the cattle at straw. I shall calculate the cows 26 weeks at 6d. per week, and the calves the same at 3d.

The

The total		£.51	2	4
7 cows 26 weeks at 6d.	-	4	11	0
3 calves at 3d.	-	0	19	6
				<hr/>
			5	10 6
Total for dung	-	£.45	11	10
1106 loads at this amount come to 9½d. per load.				

I am very clear in my own opinion that no purchased manure will be gained so cheap as this. Draw whatever comparison you please between the supposed value of this compost, and the superior worth of richer sorts, yet the quantity of one for a given price will so vastly exceed that of the other, as to have a decisive superiority; the worst manure I can purchase in the neighbouring towns comes to from 4s. to 5s. a waggon load of 80 bushels, besides a whole day's work of four horses, a man, and a waggon. Suppose the Hertfordshire price of 10s. for this team, and 4s. the dung, this is 14s. for 80 bushels, or 3s. 2d. a load of 18 bushels. Relative to the value of such dung, it is very difficult to form a comparison, for the heaps one buys are small, and not two alike; but a great proportion of the quantity, I am very clear, from the grittiness and extreme heaviness of the load, is shovelled up in the turnpike; and I have not, from the closest observation I could make, seen any superiority in it over my own farm-yard compost. It is true, I sometimes

times get a dunghill of pure old rotten dung, quite black, spit dung; but it is rarely to be had, and the price 7s. a load: but all purchased dung, except in the neighbourhood of great cities, can be had only in small quantities, whereas litter of some sort or other, and food for cattle, are every where to be had.

III.

*The Manure raised in the Farm-Yard, during
the Winter 1770-1.*

This winter I proceeded in a different manner with my dung from what I had ever done before. In the summer of 1770, I was at Mr. Bakewell's, at Dishley in Leicestershire, and remarked that he piled his dung up in a clamp in the middle of some of his yards; the idea pleased me the moment I saw it, and I determined to execute it upon my own farm. Mr. Bakewell uses only dung, but I thought it would be an improvement to unite my own method with this; and accordingly made a layer of hedge earth from a border that had been grubbed, two feet deep, and about twelve feet square. This was done the beginning of November. The quantity of earth 26 loads (of 16 bushels.) The yards and sheds were all cleaned on to it, which began my compost.

That I might be able to make the greater plenty of dung, I purchased 43 waggon loads of fern at 6s.
a load,

a load, building stacks with it;—and I had five waggon loads of stubble left from last year.

My cattle consisted of 6 horses, 4 cows, and a yearling, besides hogs. The cows were kept tied up under a shed, and regularly littered with stubble or fern; but I should observe, that I gave them so much room that it was not necessary to clean and litter every day, as is common; for if they are confined to a spot, they lie too dirty without it; but by giving them room to turn about, they were kept quite clean by only supplying them with fresh litter, and the whole cleaned out once a week. This I did that the manure might be the better, from receiving and retaining so much the more urine; nor did I throughout the winter perceive the cattle the least prejudiced by this method.

I kept the yard littered about six inches deep with fern to soak up the urine, and also to be made dung by the hogs, the only loose cattle; this was cleaned up once a fortnight.

Thus the yard, the cow-shed, the hog-sties of sows and fatting hogs, and the stables, were all cleaned into three-wheeled small carts, and piled regularly on the foundation of earth, until the heap was about seven feet high; and when one was filled up, another foundation adjoining was made.

And

And in order to make the compost the better, the flowings of the yard were partly prevented from running off, by being in one place kept a foot deep, from which they were very often thrown up on the compost with a water bowl. This liquid was the better from my penning thirty wether sheep every night on fern in a corner of the yard; but this dung was not removed till the sheep were in May begun to be fattened.

The cows were fed on cabbages and straw, and the lean hogs on cabbages alone.

I have already mentioned that I began the compost with 26 loads of earth, the beginning of November; the first week in December, 25 more were carried; and the middle of the same month 26 more. The beginning of January 18 more; the end of that month 22 more; the end of March 19 more.

November 26 loads.	January 18
December 25	Ditto 22
Ditto - 26	March 19

Total of earth 136 loads.

S T O C K.

Four cows, One yearling, Six horses.

STRAW,

STRAW, &c. eaten, and LITTER used, were

5	waggon loads of stubble at 7s.
25	ditto of fern
4	loads of straw, bought at 12s.
5	ditto, the product of four acres of oats, 12s.
<hr/>	
19	loads of hay.
<hr/>	
58	

Besides cabbages, and some turnips.

May the 27th, began to turn it over, mixing the whole well together. My agreement with the labourers was, to turn over, fill, and spread, at $1\frac{1}{4}$ d. per load, which divided is, ••

Turning over $\frac{1}{2}$, Filling $\frac{1}{2}$, Spreading $\frac{1}{2}$ per load.

Carted it for cabbages, potatoes and carrots. The amount 367 loads; besides 23 loads of sheep dung, made by 30 wethers; and about 70 loads, the last division of the heap, not touched, as it was not sufficiently rotten.

In all	-	460 loads.
Earth	-	136
		<hr/>
Remain	-	324 loads.

Which is about five and a half loads of dung for every load of straw, hay, and litter.—This is nearly the proportion of last year, and nearly that of the preceding one also, which shews that five loads and a half (of 18 bushels) may be depended on for a load of hay or litter on an average.

EXPENCES.

E X P E N C E S.

Carting 136 loads of earth into the yard,	l.	s.	d.
at $\frac{1}{4}$ d. per load	—	—	0 8 6
Grubbing 29 $\frac{1}{2}$ poles of border at 5d.			0 12 5 $\frac{1}{2}$
Ditto 5 ditto at 6d.	—	—	0 2 6
Six days driving ditto	—	—	0 7 0
Horses, &c. at 1 $\frac{1}{2}$ d.	—	—	0 14 2
Five waggon loads of stubble	—		1 15 0
Two men at ditto 2 days	—	—	0 4 8
Team at 10s. 3d.	—	—	1 0 6
25 loads of fern at 6s.	—	—	7 10 0
One man at ditto 13 days	—	—	0 14 2
Team at ditto 25 loads at 5s. 4d.	—	—	6 13 4
Four loads of straw bought at 12s.	—	—	2 8 0
Five ditto from 4 acres of oats, 12s.			3 0 0
Labour in piling up the dung, cleaning, shovelling, littering, and throwing up the water	—	—	2 9 4
Turning over 305 loads at $\frac{1}{4}$ d. per load			0 19 0
			<hr/>
			£.28 18 7 $\frac{1}{2}$

The remainder for carrots and potatoes was not turned then.

But from hence, as before, we are to deduct the keeping of the cows :

Four cows 26 weeks, at 6d.	£.2	12	0
One yearling ditto, at 4d.	0	8	8—3 0 8

Cost of the manure £.25 17 11 $\frac{1}{2}$

460 loads coming to this sum, the proportion is
1s. 1 $\frac{1}{2}$ d. per load.

Now

Now as to the success of piling it up in a clamp, I must observe, that from this winter's experience, I am clear it is an excellent method. What I used early in the spring, was in very good order for arable land; which would not have been the case had it been trodden flat over the whole yard, every particle to be washed by the rain: fermentation goes on much quicker in this method; and it would be better still if the heap were made under a roof, to keep off all water but what is thrown up. This I shall not be at the expence of.

Another advantage which is peculiar to this method is, the being able to use any part of the compost you please, without the old dung being mixed with fresh, by taking a division of the hill that has been finished some months: this for many uses is an important point. But the great object is the improvement in the quality of the dunghill, and getting it in order for any crops.

Respecting the sheep pen, it is a practice I never tried before; but I am so well pleased with the success, that I shall never winter any sheep without it. In a warm corner of the yard I inclosed a space sufficient for holding thirty sheep, and kept littering it with fern every day or two, so as always to have a dry clean bed at top for them, and this without

any layer of earth; in which, however, I failed. In five months they made me 23 loads of excellent rotten dung. It was an omission not to appropriate a load of fern, that I might have known the expence and profit, but the value of the dung was not as prices go in this country, under 2s. a load, or 46s. from thirty sheep. The sheep contracted no disorder of any kind from lying on the heap;* and went through the winter in full health. Indeed it must stand to every one's reason that such a lodging must be far preferable to the wet earth exposed to the driving rains and cold winds.

IV.

*The Manure raised in the Farm-Yard in the
Winter 1771-2.*

The seventy loads left of last winter's heap, being the last division built, remained through the summer of 1771 untouched, and the dung of this winter piled in divisions against it. In October the whole yard was littered about five inches thick with fern. The latter end of that month, and through November, I took up something more than an acre and a half of carrots, which were carted into the

* This is what we should not have expected; and although Mr. Young's sheep escaped injury, we cannot recommend the practice, as the exhalations arising from a fermented mass of manure must, we think, be very unhealthy, particularly for sheep.

yard, and there topped and cleaned; the swine attended the workmen, and ate many of the tops, but many were also trodden down with the dirt.

November the 4th, took in the horses. The 18th, tied up the cows under their sheds, littering them first with a good bed of fern, but afterwards they wasted straw enough to keep themselves well littered.—Six horses, two large cows, two Alderney ditto, a steer 3 years old, a heifer coming 8, and 3 calves of the preceding spring; in all 15 head.

Dec. 14th, made a foundation for a division of the hill, with twenty loads of earth.

Upon taking the cattle in, I began threshing; but foreseeing that I should not have a sufficiency of straw, I purchased four loads the 8th of January.

Jan. 27th, made another foundation of forty-six loads of earth. The 30th, purchased two loads more of straw. This is a commodity so very scarce this year, owing to the cheapness of cattle, that I am forced, for the six loads I have bought, to pay 14s. a load, and to send ten miles for it.

Feb. 10th, two loads more from the same place, one at 14s. and one at 17s. Much of this was pease
C 2 straw,

straw, and being good, I have fed all my horses with it, and they perform their work well, but then they have a regular allowance either of carrots or oats.

The fifteen head of cattle ate ten trusses of straw every day; besides what is used to litter the swine.

Feb. 19th, made another foundation with thirty-six loads of earth. The 24th, bought a load and a half of straw more; March 9th, as much more. At this time, turned over all the dunghill, except the last division, designing it for potatoes. Put it put to the men on the same terms as last year, to turn over, fill, and spread.

While this work was performing, I had an opportunity of observing the effect of throwing up the drainings of the yard, which I had regularly performed; one side of the hill was not near watered so much as the other, owing to its being more distant from the lower part of the yard that retained the drainings; in that part of the heap the dung was not equally rotten, nor had it that putrid moisture discernible in much of the latter. Let me also observe, that the parts which consisted mostly of fern, were much sounder, though of double the age, than others which consisted of straw.

March

March 30th, bought two loads more; and the 20th of April two more. The beginning of that month turned over the whole.

The Earth brought in was 102 loads, viz.

December 14th	—	20
January 27th	—	46
February 19th	—	36

Straw, &c. and Litter.

18 loads of fern
 15 loads of straw bought.
 35 $\frac{1}{2}$ ditto, the product of 21 acres
 16 loads of hay

84 $\frac{1}{2}$ loads—Besides cabbages.

Carted, after turning over for potatoes, cabbages, and turnips,

The total of loads	—	—	456
Deduct 70 loads accounted for last year			<u>70</u>
Total of this year			386
Deduct	—		102
Remain			284

Or about three of dung for each load of hay and litter, which is less than I have had before, owing, I apprehend, to my attending more to the throwing up the water, and thereby rotting it more and sooner than before.

E X P E N C E S.

		£.	s.	d.
Carting 102 loads of earth at $\frac{1}{4}$ d.	—	0	6	4 $\frac{1}{2}$
Three days driving ditto	—	0	3	6
Team, &c. at 2 $\frac{1}{2}$ d.	—	1	1	3
Eighteen loads of fern, at 6s.	—	5	8	0
One man at ditto, 9 days	—	0	10	6
Team at 5s. 4d.	—	4	16	0
Fifteen loads of straw bought	—	10	13	0
Team, labour, &c. 8 days, at 16s. 10d.		6	14	8
Thirty-five loads and a half at 15s.		26	12	6
Labour in piling up, cleaning, littering, and watering	—	2	17	8
Turning over 386 loads at $\frac{1}{4}$ d.	—	1	4	1 $\frac{1}{2}$
		£.60	17	7
Deduct 5 cows 26 weeks, at 6d.	3	5	0	
Three calves at 4d.	—	1	6	0
4 horses 11 weeks straw, at 6d.	1	2	0	
Two ditto 23 weeks, at 6d.	1	3	0	
		6	16	0
Cost of the manure	£.54	1	7	
Which is 2s. 9d. per load.				

The compost came last year to only 1s. 1 $\frac{1}{2}$ d. now to 2s 9d.; this great rise is owing to three reasons:

1st. The dearness of all the work of the team, owing to the price of corn and hay.

2^{dly}. To the extreme high price of the straw; what I bought came to (with carriage) 1l. 2s. 5d. per load.—And,

3^{dly}. By

3dly. By watering the heap more than usual, it was more purified, and consequently less in quantity.

V.

The Manure raised in the Farm-Yard in the Winter 1772-3.

I pursued the same system this year, as before, except the cows and two horses being for a short time loose in the yard, not tied up as before. The quantity of earth carried in at different times was 115 loads, 30 of which were ditch stuff, the rest turf from furrows ploughed in a meadow; consequently excellent for a compost. Besides this I brought twelve waggon-loads of chalk, being a very fine marle; but as some of it was wet and heavy, I do not reckon these loads to contain more than three cart loads.

A farther addition made to the heaps during the winter, consisted of different manures brought from London; two waggon loads of ashes, (each 90 bushels) four ditto of bones, (90 bushels) one cart load of bones, (36 bushels) and five waggon loads of night soil, (each 60 bushels.) I conceived that mixing these different bodies with my yard-dung, as it was made, would very much enrich the whole mass.

Litter,

very well on them for three weeks, and in rooting among them brought them into a fine state for putrefying. I should observe, that the little summer heap of dung, &c. was so disposed in the lower part of the yard as to keep in a large puddle of water, which in summer becomes very black and rich, and is of excellent service for rotting weeds, or rubbish of any kind. The only caution necessary is to take care it is not too deep, as any thing entirely immersed will not rot; but if much of what you throw in lies between wind and water, and is sometimes stirred, it will presently rot. When the hogs had done with the potatoe tops, they were successively thrown into this water, and so became a very putrid rich body of manure.

I formed the compost hill in the same manner as last year: laying ditch earth at bottom, and piling up the dung upon it; that is, the stables, sheds, and hog-houses, were cleaned on to them; the cattle being 6 horses, 11 cows, steers, and heifers, besides many hogs lean and fatting.

I also brought from London, one waggon load of bones, and seventeen of night-soil, which I had got thrown up early in autumn, to be dry enough to bring; yet herein I was disappointed, for it was but in indifferent order, so that these seventeen loads,

loads, from wetness, were not equal to more than twelve full ones dry. In point of quantity, therefore, I must call the London manure 13 waggon loads, or 65 cart loads.

The quantity of earth carted in was 157 loads. The litter, &c. used was $60\frac{1}{2}$ loads, viz.

12 loads of straw bought
31 from my own crop
 $17\frac{1}{2}$ of hay.

The total heap amounted to 532 loads, and the cost 38l. 9s. 7d. Earth, &c. deducted, it is 375 loads, or 6 for every load of hay and straw. The expence is 1s. 5d. per load.

Part of the account of this year's dung, and the whole of the winter 1774-5 was lost.

Average, Five loads of dung, at 18 bushels per load of hay and straw.

	Loads.			Loads.
1768	$5\frac{1}{2}$	|	1771	3
1769	6	|	1772	4
1770	$5\frac{1}{2}$	|	1773	6

Upon this I may observe, that, supposing forty loads a good manuring for an acre of land that
has

has once been improved, the consumption of eight loads of straw and hay yields that quantity, with the help of certain portions of earth, at the same time that the live flock is supported by such consumption;—and if an acre of corn yields two loads of straw, which it does on an average, then one-fourth of the corn and hay ground is manured every year, which proves at once the excellency of the system; for that proportion is very rarely attained on any farm, if tithe-gathering is not connected with it.

The expence per load of 18 bushels, was

	£.	s.	d.			£.	s.	d.
In 1768	0	1	4½	|	In 1771	0	2	9
1769	0	0	9¾	|	1772	0	2	4½
1770	0	1	1½	|	1773	0	1	5

The mixture of London and other manures makes me omit drawing my average.



ARTICLE II.

*Miscellaneous Observations on a variety of Plants, &c.
considered in an Agricultural and Commercial View.*

[By Mr. ABRAHAM CROCKER, of Frome.]

GENTLEMEN,

TO a Society whose principal view is the promotion of Agriculture, every species of useful information, relating to the vegetable kingdom, may be useful. I shall therefore take the liberty of presenting you with a few detached observations on a variety of plants, &c. collected from various authors, which, although generally known by persons skilled in botany, may be new and useful to many of your readers, if you should think them worthy of publication.

Butterwort—Yorkshire Sanicle—on Bogs.

If the fresh-gathered leaves of this plant are put into a strainer through which the warm milk from the cow is poured, and the milk is set by for a day or two to become aced, it acquires a consistence and tenacity; the whey does not separate, nor does the cream. In this state it is an extremely grateful food, and used as such by the inhabitants of Sweden. Half a spoonful of this prepared milk,

milk, mixed with fresh warm milk, will convert it to its own nature; and this again will change another quantity of fresh milk, and so on *ad infinitum*. The juice of the leaves will kill lice in sheep and other animals. The common people use it to cure cracks or chaps in cows udders. This plant is thought to occasion the disease called the rot in sheep. But it is much more likely that this disease is owing to a flat insect called the *fluke*, [*Fasciola hepatica*] which frequently adheres to stones and plants in marshy grounds, and other wet situations; as the same insects are found in the liver and biliary ducts of sheep infected with the rot. No cattle will feed on this plant.

Sheep's Fescue.

An excellent grass, which flourishes best in a dry sandy soil. Cows, horses, and goats, will eat it, but it is the favourite food of sheep. They prefer it to all other grasses, and being very succulent, it fattens them sooner than any other. The *Tartars*, who lead a wandering life with their flocks and herds, always choose those spots where this grass abounds. The superiority of the Spanish, and some of the English wool is probably owing to the abundance of this grass in hilly pastures where sheep are kept. It is certainly worthy particular cultivation by farmers.

Flote Fescue.

In Wet Ditches and Low Lands common.

The seeds of this grass are small, but very sweet and nourishing. In divers parts of Germany and Poland, they are collected under the name of Manna seeds, and served up in soups and gruels at the tables of the great, on account of their grateful flavour, and nutritious quality. When ground to meal, they make bread very little inferior to that in common use. The bran is a remedy for the worms in horses, but they must be kept from water for some hours afterwards. The seeds are excellent food for geese.

Broom Grass, [Compact. Hordeaceus.]

The seed of this grass, mixed with corn, is useful for bread. The panicles are used in Sweden for dying green.

Couch Grass:

Too common every where!

But this plant has its uses and its virtues. The roots, dried and ground to meal, have been used to make bread in years of scarcity. Dogs eat the leaves as an emetic. *Boerhaave* recommends the juice to be drunk liberally in obstructions of the viscera, particularly in cases of schirrous liver, and jaundice.

jaundice. Cattle who have schirrous livers in winter, soon get cured by eating it in the spring.

Burnet

Is so luxuriant as to allow three mowings in a season. The young shoots make an agreeable salad. The green leaves give a grateful flavour to wine.

Goose Grass; i. e. Yellow Ladies' Bedstraw.

The flowers will coagulate boiling milk, and the best Cheshire cheese is said to be prepared with them. They yield an acid by distillation. Boiled in allum-water, they tinge wool yellow. The roots dye a fine red, not inferior to madder, and in the island of Java are used for this purpose. The seeds may be used instead of coffee.

Holly

Makes an impenetrable fence, and bears cropping. Sheep are fed in the winter with the croppings. Birds eat the berries. The bark fermented, and then washed from the woody fibres, makes the common bird-lime. The beauty of its scarlet berries never suffers from the severest of our winters. The wood is excellent for veneering, and is sometimes stained black to imitate ebony. Handles for knives, and coggs for mill-wheels, are made of it.

Gromwell;

Gromwell; i. e. Bastard Alkanet;

In corn fields common. The girls in the Northern parts of Europe paint their faces with the juice of this root on days of publick festivity. The seeds are hard as bone, and effervesce with acids. The bark of the root tinges wax and oil of a beautiful red, similar to that which is attained from the root of the foreign alkanet kept in shops.

Borage.

By the experiments of *Marggraff, Mem. de Berlin*, p. 72, it appears, that the juice of this plant affords a true nitre. The young and tender leaves are good in sallads; but it is mostly used as an ingredient in cool tankards.

Bindweed, [Convolvulus Major.]

The root is a very acrid purgative to the human body, but hogs eat it in large quantities without sustaining any injury. Scammony is the inspissated juice of a species of *Convolvulus* so much resembling this, that they are not easily distinguishable. Can it then be worth while to import scammony from Aleppo, at a great annual expence, when a medicine with the very same properties grows spontaneously in many of our hedges? Might it not be worth the Society's attention to offer an Honorary Premium for making scammony from this plant?

Dwale, i. e. Deadly Nightshade,

Is a plant rankly poisonous throughout. Children, allured by the beautiful colour of the berries, have often fatally eaten them. They cause a stupor and delirium, to which succeed convulsions and death, if not prevented by timely and strong emetics. It has been successfully used in cancerous cases. See *Ray*, and *Phil. Transact.* vol. 50, p. 77.

Buck-Thorn.

The syrup is used as a purgative, but frequently attended with much sickness and griping. The juice of the unripe berries is used for staining maps or paper yellow. The juice of the ripe berries mixed with allum, is the sap green of the painters; but if they are gathered late in autumn, the juice is purple. The bark affords a beautiful yellow dye.

Ivy.

The roots are used by leather-cutters to whet their knives upon. The small branches stuck over the branches of wall-fruit in February, are the best preservative against frost affecting the bearing blossoms. The leaves are often given to sheep in deep snows.

Madnep, i. e. Cow's Spondylium, Cow Parsnip.

The poor people in Poland prepare a liquor from the leaves and seeds, which, when it has undergone

undergone a fermentation, is drunk instead of ale. The stalks when peeled, are eaten by the inhabitants of Kamtschatka. The Russians take the leaf-stalks of the root-leaves, peel, and hang them up in the sun to dry a little; then they tie them up again until they become yellow; in this state they put them into bags, and a mealy substance like sugar forms upon the surface; this they shake off, and treat their guests with as a great delicacy.

Elder.

The whole plant is a narcotic. The inner green bark is purgative—in small doses diuretic, and has been of eminent service in dropsies and obstinate glandular obstructions. If sheep that have the rot are placed in a situation where they can get at the bark and young shoots, they will soon cure themselves; therefore it is worthy of propagation.

Chickweed.

The young shoots and leaves when boiled, can scarcely be distinguished from spring spinach, and are equally wholesome. This is one of the sleeping plants.

The Barberry, or, Pipperidge Shrub,

Is excellent for quick fences in pasture lands. The berries are so very acid, that birds will not eat them; but when boiled with sugar, make an excel-

lent rob or jelly. The roots boiled in lye, dye wool yellow. In Poland, they dye leather of a most beautiful yellow with the bark of the root. It is said to be prejudicial to corn-lands.

Heath—Erica,

Common on lofty barren hills, and though little regarded, might be made to serve many valuable purposes. In the Highlands of Scotland, the poor inhabitants make walls for their cottages with alternate layers of heath, and a kind of mortar made of black earth and straw. They also make beds of it; and their houses are thatched with it.

In the isle of Ilay, ale is made by brewing one part malt, and two parts of the young tops of heath.

Woollen cloth boiled in allum water, and then in a strong decoction of the tops of heath, comes out a fine orange colour.

The stalks and tops will tan leather. Bees extract great quantities of honey from the flowers, which are very beautiful.

Wild Roses.

The ripe fruit makes a pleasant rob. The juice diluted with water dyes silk and muslin of a peach colour; with the addition of allum, a deep violet; but it has little effect on woollen or linen.

The

The Lime-Tree

Flourishes best on the sides of hills, is easily transplanted, and grass grows well beneath it. It is very ornamental for clipped and shady walks. The wood is soft, light, and smooth; close grained, and not subject to the worm. It makes good charcoal for gunpowder and for designers. It is used by turners, carvers, and leather-cutters. In some countries, the leaves are dried as a winter food for sheep and goats. Cows eat them in autumn, but they give a bad taste to the milk. The bark, macerated in water, may be made into cordage and fishing nets. The flowers afford the best honey for bees. The sap, when inspissated, yields a quantity of sugar.

Larkspur.

The expressed juice of the petals, with the addition of a little allum, makes a fine blue ink. The seeds are acrid and poisonous.

Ground-Ivy.

The leaves thrown into the vat with ale, clarify it, and give it an antiscorbutic quality. The expressed juice mixed with a little wine, and applied morning and evening, destroys the white specks on horses eyes.

The Milk Thistle

Is eaten young as a sallad. The stalks peeled, and soaked in water to take out the bitterness, and then boiled, are excellent. The scales of the cup are as good as artichokes. The root is good to eat early in the spring.

The Beech Tree

Is large and beautiful, but no verdure will flourish under it. It is difficult to transplant, and loves a fertile soil; bears lopping well, and may be trained to form lofty hedges. The wood is brittle, and soon decays in the air, but endures under water. It is formed into tool-handles, planes, mallets, chairs, and bedsteads; when burnt, it is excellent fuel, and yields a large quantity of pot-ashes. The leaves gathered in autumn, before they are injured by frosts, make far better mattraſſes than either straw or chaff, and endure for seven or eight years. The nuts or masts, when eaten, give the head-ache; but well dried and powdered, make wholesome bread. They are sometimes roasted and substituted for coffee. In *Silesia*, the poor people use the expressed oil instead of butter. They are excellent for fattening swine.

The Scotch Fir

Flourishes best in a poor sandy soil. In groves, the trunk becomes tall and naked; in open sunny situations,

situations, branched; on rocks and bogs, it seldom grows to a large size. In black soil, it becomes diseased; and in chalky land it dies. Sometimes it will thrive near running, but never near stagnant waters. The roots spread near the surface of the earth, except the central root, which grows perpendicularly downwards; and if this be broken off, or interrupted in its passage by rocks, the stem ceases to shoot upwards, and the tree ever remains a dwarf.

This tree furnishes us with the best red or yellow deal. Its bark will tan leather. The Northern nations make bread from this tree in the following manner:—They choose a tree whose trunk is even, (for these contain the least resin) and strip off the bark in the spring, when it peels most easily. This they first dry gently in the shade, then in a greater heat, and reduce it to powder; with this powder, they mix a small quantity of meal, and with water knead it into bread. This they eat in common. The young shoots distilled, afford a fragrant essential oil.

Willow, and Poplar.

The common uses of these trees are well known; but that species called *Abele*, or *Populus Alba*, (common in woods and hedges) deserves particular notice, on account of the virtue its bark possesses
in

in curing intermitting fevers. The Rev. Mr. *Stone*, in *Phil. Transact.* vol. 53, p. 195, tells us, that he gathers the bark in summer when it is full of sap, and having dried it by a gentle heat, gives a dram powdered every four hours betwixt the fits. In a few obstinate cases, he mixed one-fifth part of Peruvian bark with it.

It is remarkable how nature has adapted remedies to diseases. Intermitting fevers are most prevalent in wet countries; and this tree grows naturally in such situations. The bark of it is an object well worthy the attention of physicians; and if its success, upon a more enlarged scale of practice, prove equal to Mr. *Stone's* experiments, the world will be much indebted to him for communicating them. This bark will also tan leather.

Pillitory of the Wall.

The leaves of this plant, strewed in granaries, destroy the weevil in corn.

Many of the above hints may possibly appear trifling; but when it is remembered, that the aggregate of human knowledge consists of minute parts, which though abstractedly considered appear of little consequence; yet when relatively
viewed

viewed in their connection with the whole, they acquire sufficient importance to claim attention and regard from the publick.

I have the honour to be,

Your very humble servant,

Frome, March 16, 1785.

A. CROCKER.

ARTICLE III.

The Rev. Mr. Onley's Mode of cultivating his Farm.

[In a Letter to the Secretary.]

THE exact attention of the Bath Agriculture Society to the principles of their very excellent institution, could not be more strongly proved, than by the honourable notice they have condescended to take of the trifle I took the liberty of submitting to Mr. Young. I shall be happy by furthering any enquiries they may wish to make in this neighbourhood; in which, on farms of a moderate size, agriculture in a plain method is perfectly understood, and with hard labour and moderate gain very diligently followed.

To

To aim at meriting the compliment I have received, whether I can be of any such service, will be best conjectured by an account of my usual management of seventy acres; though it will probably lessen very much any opinion of my capacity as a farmer, when I acknowledge that forty of these are constantly in pasture, and the other thirty only cultivated as subservient to grazing, by producing the necessary stover and artificial pasture for the troublesome cravings in winter and spring. Amusement on this simple but rough plan is united with great conveniency, at moderate expence, little attention, and no material hazard. The thirty acres of arable are in four fields; and if a compleat year's fallow does not follow the wheat crop, (which is here occasionally necessary even to the neatest farmer towards purifying the soil, and which by lease is never permitted to go beyond a third crop, turnips and clover excepted) my routine is or may be, from the manure I can afford, if I am not out of humour at a little extra trouble, as follows:—

As soon as possible after the wheat is off, the stubble is mown, and stacked for littering the cow-yard in winter, the field ploughed, and half of it sown with two bushels of small black winter tares, and one bushel of rye; the other half is well fallowed

fallowed and dunged, as opportunity and the season permit, till Midsummer, when either turnips are sown or cabbages planted on it; and the tares being by that time entirely fed off, are ploughed in, and occasionally during the summer fallowed, and dunged if necessary, as the other half was during the spring. In the following spring, the turnips or cabbages being fed or carted off by March, this field is, at once-ploughing, sown with oats or barley, and one bushel of ray-grass, and half a peck of clover-seed, per acre. This large portion of ray-grass seed renders the feed of it much finer, brings it earlier, and, as it ought never to be permitted to run to any luxuriance, removes every prejudice against it.

When the corn is off, a small quantity of dung, if it can be afforded, will contribute to bring this excellent pasture sufficiently forward for cattle—at the latest in the very beginning of May the following year; from which period, it is *continually* depastured on till nearly the end of September, when, at once-ploughing, wheat is sown on the field; and the rotation commences again.

Having thus the four years' cultivation of one field, you have the state of annual crops of my four fields; the great conveniency of which is, to
a gen-

a gentleman—as subservient to his grass land, which any attentive gentleman can manage as well as the best common farmer—that the corn-land produces or buys oats, and wheat-chaff, and straw, for the stable; oat-chaff, and straw, for the dry cattle; and stubble-straw, for littering down the cow-yard;—turnips or cabbages, as green provender for milch or fattening cattle from December to the end of March;*—tares from thence to May;—and ray-grass, till natural pasture is in full luxuriance.

To me, who seldom keep sheep, and only take in oxen for *summer feed*, this *exact* succession of vegetables is not essential; to those who do, it is highly so; but I always have such a portion of it, as to keep the dairy in full milk. As turnips are a troublesome crop on lands that are heavy and moist; and cabbages, I guess, a wearing one;† on such it is more convenient to sow immediately after the wheat the *whole* field with rye and tares for only very early spring feed; and leave a pasture-field

* Mr. Onley has not given an account of the application of the rye sown at the same time with the tares. We conclude it is fed off as soon as the turnips are finished, as it affords feed for cattle before the earliest spring grasses or tares, and is constantly sown for that purpose in many parts of Suffolk and Norfolk, and the land is fallowed for a turnip crop after the rye has been fed off once or twice.

† This would be in some degree compensated, if the manure made by the cattle while fed with cabbages in the straw-yard, were all carried on the field. Till this be done, or allowed for the estimate, a comparative calculation cannot be fair, because when turnips are *fed off* by cattle, (which is never the case with cabbages) the field is greatly enriched by the manure they make upon it.

unfed

unfed from September to December, to afford (which in general it will do) good rough feed for the cattle a few hours every day in the winter, till the tares are ready to receive them. By the tares and rye being thus early fed off, the field is not only well manured in the easiest mode, but the pasturage at that critical season is sufficiently valuable to answer the expence of the whole year's fallow; which with us, heavy lands, especially if intended for *barley* in the following spring, must have. In such circumstances, expensive as tare-feed is, this little crop (even at *once* feeding, in order that the fallowing the field may commence with May) is valuable even to a common farmer.

Where gentlemen will afford the necessary attention, the drill and horse-hoeing husbandry is, in point of elegance at least, their peculiar province; but as the expence of it is, I conclude, on any considerable scale very great,* and exactness peculiarly necessary, it is improbable that it should exceed in profit the usual husbandry; where, by a rotation of grass, pulse, and corn crops, all equally essential, and an opposite species always succeeding to another, the land is never surfeited by sameness; the cultivator subject to little disappointment, some

* The expence is much lessened by divers excellent machines lately introduced into practice, some of which will be described in course of this work.

portion of his crops making up for the failure of others; and the farmer with his plain instruments, gradually drawn into a degree of hoeing culture.

But as produce is too frequently very distinct from profit, a series even of such crops will on much land, from the expence of hoeing and manure, not equal a shorter circle with intervening fallows. On light lands proper for turnips, little ploughing is necessary to pulverize the soil, but much manure necessary to maintain its vegetation; on a heavy soil, little manure is necessary for the latter, but much ploughing for the former; yet the barley crop following the fallow on the heavy, will fully equal in value the joint one of the turnips and barley on the light soil.

A general series of crops can never without much exception be laid down; variety in the series, and the utmost cleanliness in supporting it, are every where essential; but what should be that series at the least expence and most profit, depends on such local circumstances as must be left to the immediate farmer. As to the ploughing with four or five horses at length with a heavy plough, when a light one and a pair of good horses abreast are equal to the heaviest soil; the throwing away a large portion of seed in order to ensure a crop, and
refusing

refusing to hoe for fear of lessening it; such absurd practices arise from a barbarous obstinacy, that nothing but ridicule enforced by an opposite example can cure; and that can rise only from gentlemen undertaking to give an experimental proof; and, on the most meritorious plan of the Bath Society of Agriculture, amply rewarding the laborious that will pursue the returns of industry, the ingenious that will try the hazard of experiment, and the ignorant that will submit to conviction.

I am, Sir,

Your very obliged servant,

Stisted-Hall, Essex,

CHA. ONLEY.

June 29, 1784.

*Cultivation, Expence, and Profit, of One Acre, Arable,
for four Years.*

<i>Years.</i>	<i>Expence.</i>	<i>Years.</i>	<i>P.</i>
<i>1st.</i>	<i>£. s. d.</i>	<i>1st.</i>	<i>£. s.</i>
Sowing, tilth, &c.	0 4 0		
Tares 2 bush. rye 1 bush.	0 13 0	Rye and tare-seed	1 11
Fallowing-tilths	1 0 0		
Rent, rates, tithe	1 1 0		
<i>2^d.</i>		<i>2^d.</i>	
Sowing, tilth, &c.	0 4 0		
Seed-oats 4 bushels	0 8 0	Oats 5 quarters at 16s.	
Harvesting	0 5 0	per quarter	4 0
Rent, rates, tithe	1 1 0		

3d.		3d.	
Ray-grass and clover-feed		Ray-grass and clover-	
sown with oats	0 5 0	feed	— 2 0 0
Rent, rates, tithe	1 1 0		
4th.		4th.	
Sowing, tilth, &c.	0 6 0		
Seed-wheat 2 bushels	0 10 0	Wheat 3 quarters at 2l.	
Hand-hoeing —	0 5 0	per quarter —	6 0 0
Harvesting —	0 6 0		
Rent, rates, tithe	1 1 0		13 10 0
	<hr/>		
	8 10 0		8 10 0
NETT PROFIT £.5 0 0			

The haulm, straw, and chaff, are presumed to pay for threshing the corn; and the land, being in the grass-years fed, to require little, if any dung. If the land be light, turnips or cabbages will be more profitable than tares and rye, but will require a large portion of dung. For mere conveniency a mixture of these crops is most eligible. Barley will certainly pay better than oats; and if a compleat fallow be taken, without *any* feeding crop, as requiring so much less trouble, should probably be preferred; though the straw is much less valuable for the feed of cattle in winter, than that of oats. The hand-hoeing of wheat in the spring is undoubtedly expensive; but if the plant be thick and forward, it may safely be *sheep-fed*, and then harrowed and hoed; and this, besides *some* security against mildew, affords a little advantage to thick-sown wheat.

C. O.

ARTICLE V.

An Account of Glauber's Salt, extracted from the Rubbish of an old Furnace.

[By the Rev. George Swayne, Pucklechurch.]

SINCE a perusal of Dr. Watson's very elegant Essays on Chemistry, my curiosity has led me to examine several matters with an eye of analytical enquiry, which before had scarce attracted a superficial notice.

Among these, as I was one day looking round a steam-engine which has long been erected at the coal-works in this neighbourhood, I perceived the bricks and mortar surrounding the furnace to be very fully impregnated with a substance which from its appearance I judged to be saline. From the circumstance of the above-mentioned ingenious author extracting a true nitre from the mortar of an old barn, it immediately occurred to me, that this substance could be no other than such nitre, particularly as it appeared in many places already crystallized. Workmen were at that time removing the furnace, which was in a state of decay, in order to substitute a new one in its place. I took home with me a small quantity of the rubbish, and examined it by the usual analysis. The quantity ex-

amined was twenty ounces. Having elutriated the mass sufficiently with hot water, filtered and evaporated the solution till a pellicle was forming on the surface, I set it by to shoot; when it had stood a sufficient time, I found plenty of the most beautiful prismatic crystals deposited. But I was not a little surprized to find that these when committed to the fire would not deflagrate; whereupon, tasting this substance, I concluded it to be not salt-petre, but that species of salt which is termed by chemists *Sal Mirabile*, or Glauber's Salt. The quantity of saline matter obtained from the whole solution weighed six ounces.

On farther consideration, it does not seem difficult to account for the production of one of the constituent parts of Glauber's salt in the place where this was found. It is well known to chemists that the acid of sulphur is the same as the acid of vitriol, and that this acid is one of the essential parts of Glauber's salt. Pit-coal contains a large proportion of sulphur. The acid, I apprehend, is sublimed in the fire, and meeting in its ascent with the steam which is constantly evaporating from the furnace, becomes condensed, is precipitated, and imbibed by the absorbent matter of which the walls are composed. To account for the other constituent part does not appear to me quite so easy.

easy. Pit-coal however, it is certain, contains some small proportion of the fossil alkali, which, though fixed in a less degree of heat, may be rendered somewhat volatile; that is, may be expelled to some considerable distance by that intense degree of heat which usually melts the ashes, and converts them into glassy scorixæ.

The water likewise which is drawn from coal-mines is, I am told, somewhat brackish; if so, consequently it contains sea-salt. This water, after being elevated, is constantly dropping from the furnace, and different parts of the engine, on the walls and ground beneath; where, if it found the condensed vitriolic acid, which is more powerful than the marine, the latter would be expelled, and the former attaching itself to the alkali, their union would produce the neutral salt in question. I am not quite satisfied with this supposition respecting the alkaline part of the composition, as I cannot conceive that even both sources from whence I have supposed the alkali to proceed, could furnish any considerable quantity. It is a fact, however, that a salt is produced in the situation I have described, which I take to be a true Glauber's salt. I have sent you a specimen; and could wish to have it examined by a person of more knowledge in these matters than I can pretend to.

If I might judge from the preceding analysis, there could not be less than half a ton of this salt collected in the rubbish which surrounded the furnace, and was then removing. Such a quantity, one would apprehend, must be of considerable value; especially as it might be easily extracted with very little expence; hot water for the solution being always ready on the spot, and even constantly flowing to waste, whenever the engine is at work. Supposing this substance to be a true and genuine Glauber's salt, I think there may be methods found out for collecting and increasing it, which would make it an object to the proprietors of steam-engines, well worth their attention.

Dr. FOTHERGILL being present at the meeting when the above letter was read, at their request examined the samples of salts, and sent in the following

R E P O R T.

GENTLEMEN,

Agreeable to the Society's request, I have examined the specimen of the salt which your ingenious correspondent, Mr. Swayne, obtained from the mortar and brick-work of a coal-engine; and find it to possess the following properties:—

It has a peculiar bitter taste, like that of Glauber's salt; like that too, it has hexangular prismatic crystals, easily soluble in water, fusible in the fire, and calcinable in the air. A solution of it does not alter the syrup of violets, or tincture of litmus;—undergoes no precipitation from acids

acids or alkalies; nor can it be decomposed but by the addition of phlogiston;—because having the mineral alkali for its basis, the vitriolic acid (being the other ingredient in its composition) cannot be detached from it by any other means. From these circumstances, I conclude, there is no doubt of its being a native Glauber's salt.

On administering it internally, to the amount of six drams in half a pint of warm water, it operated mildly three or four times, without producing nausea, sickness, or griping. This was repeated twice in two different persons alternately, with an equal quantity of the common Glauber's salt of the shops, and was allowed by both persons to be less nauseous, and more easy and pleasant in its operation. Nor is this to be wondered at, as the common Glauber's salt is often found not perfectly neutralized, having a portion of redundant vitriolic acid, which renders it offensive to the stomach and bowels. Whereas this native salt is free from that inconvenience, and operates with equal mildness as the purging salt which I lately obtained from Cheltenham water.

In order to obtain the present salt in its most perfect state of crystallization, the water in which it is dissolved ought to be evaporated very leisurely, and not too far, because a considerable portion of water is essential to the form and transparency of the salt.

From the imperfect state of the specimen which you sent me, the crystals seem to have been deprived of their due quantity of water; and this is still more evident in the sample which Mr. Swayne terms "a more refined sort."

I am, Gentlemen,

Your very obedient servant,

Walcot-Parade, Bath,

A. FOTHERGILL.

Sept. 17 1782

ARTICLE VI.

On the Application of Chemistry to Agriculture, and Rural Economy.

[By A. FOTHERGILL, M. D. F. R. S. Bath.]

Hæ tibi erunt artes.——

VIRG. *Æneid*, lib. vi.

Verè scire est per causas scire.

VERULAM.

AGRICULTURE is undoubtedly the most ancient and honourable of all the arts, since it dates its origin from the highest antiquity, and appears to have been coeval with the first parents of the human race. Though it has received all the improvements of a long succession of ages down to the present time, whence is it that its progress towards perfection has been much slower than that of many others of a far more modern date?—The chief causes which have retarded its advancement, seem to be the three following:—

First, The extreme difficulty of the study of Agriculture.

Secondly, The want of proper Masters to unfold its principles, as in other branches of Experimental Philosophy. And,

Thirdly, The great reluctance of Farmers to quit the beaten track.

So

So complex is the study of Agriculture, that it involves a multiplicity of objects of the most abstruse and recondite nature, which never can be thoroughly understood without a previous knowledge of many other arts, and particularly of Chemistry. And yet this important science has been uniformly committed to the sole management of the illiterate part of mankind. These being unable to learn, for want of persons qualified to teach, have obstinately pursued a routine of random practice, in imitation of their forefathers, without any settled principles. Innumerable errors have thus been transmitted from one generation to another, under the fallacious appearance of being the result of long experience. Can we wonder then that the theory and practice of agriculture are yet far, very far, from having reached the summit of perfection? Chemistry indeed has not till of late years been applied to agriculture and the œconomical arts, though the principal operations of each evidently depend on chemical principles.

It is not to be expected that every husbandman should be a profound chemist; but I will venture to say, that every gentleman who wishes to improve his estate, and to advance the art of agriculture, ought to be well versed, at least, in the principles of philosophical chemistry; without which
he

he can neither conduct experiments properly, nor explain the several phenomena satisfactorily which result from them.

The uses which chemistry may be of in agriculture are great and extensive, but my present bounds will only permit me briefly to mention a few of them.

To this art it belongs, to distinguish the sundry kinds of earth, according to their natures and proportions;—to determine which of them are the fittest for different purposes;—to ascertain the different qualities of the various sorts of manures, and to point out proper methods of applying them;—to discover the best method of improving a barren soil;—to effect by a suitable mixture of earths, what is not to be accomplished by manure alone.

The earths which most commonly occur are clay, sand, and calcarious earth, none of which alone is adapted to the support of vegetables. Hence in a good soil, they are therefore generally found mixed, at least two of them, together with a portion of decayed vegetable substances.

Clay retains moisture the best; after clay, calcarious earth; sand dries rapidly. Hence it follows,

lows, that from the different proportions in which they are mixed, result so many different capacities for retaining water. Hence too the inferior as well as superior strata of the soil ought to be examined, as well as the mean state of the weather with respect to drought or moisture, and opportunities of watering, &c. For the best soil will prove sterile without a due proportion of moisture.

To render land capable of producing a small crop of grain, requires no great skill; but to cause it to yield the greatest possible crop, demands no common management. Is it not disgraceful to behold the execrable husbandry which prevails in some parts of this opulent county, where it is no unusual thing to see corn and weeds struggling together for the superiority, till the latter, gaining the ascendancy, stifle the meagre crop, and spread triumphantly over all the neighbouring grounds!

To chemistry it appertains to suggest suitable means for preserving grain from smut, blights, or mildew; also for destroying, or driving away insects, reptiles, and other noxious vermin, which are wont to prey on fruits, seeds, or vegetables.

When the products of agriculture are at length obtained, the aid of chemistry is still essentially
necessary

necessary towards their preservation, and the means of fitting them for the various purposes to which they are destined.

Grain, and farinaceous vegetables, are convertible into flour, bread, starch, malt, &c. In proportion to the saccharine matter contained in them, they become subjects of the vinous and acetous fermentation, and hence the operations of baking, brewing, the making of wine, cyder, vinegar, &c. are so many chemical processes; which, for want of the requisite stock of knowledge, in many cases either fail altogether, or are carried on with little advantage.

The preparation of flax and hemp for sundry uses, and the operation of bleaching and whitening linen; also of preserving wood from putrefaction, and preparing other vegetable productions for various æconomical purposes, depend all on chemical principles.

The productions of the animal kingdom afford a variety of raw materials which enrich the farmer, and which by suitable management constitute no inconsiderable share of the national wealth. Such as meat, eggs, milk, butter, cheese, honey, wax, tallow, hides, &c. All which, by chemical art,
may

may be preserved in a sound state for a considerable length of time, or even sometimes restored, in a great measure, after corruption has begun to take place. They may also be further improved, and converted to a variety of æconomical uses to the highest advantage, if their chemical properties are properly understood.

An eminent author has very justly observed, that the application of chemistry to arts and manufactures, is an object of a very interesting and extensive nature; because many of them consist of a series of chemical processes from beginning to end, others only in certain stages; the rest being performed by mechanical operations. Though arts and manufactures might owe their first origin to chance, or random experiments, yet the improvement and perfection of them must ultimately depend on certain facts, and principles, which it is the province of chemistry to illustrate and explain.

Private interest indeed has long checked the progress of the arts, and selfishly monopolized the most lucrative employments, by casting a veil of secrecy over the different processes; but chemistry assists us in drawing aside the veil, and oftentimes too in accomplishing the end, by more simple and efficacious means.

In

In short, from the foregoing observations it appears, that both in public and private manufactories, and various articles of rural œconomy, a multitude of operations are continually going on, which undoubtedly depend on chemical principles. It were therefore earnestly to be wished, that an accurate inquiry into the present state of the arts throughout the kingdom were to be undertaken, and repeated at certain intervals, with a view towards their improvement. This would supply many curious and useful facts, which before were not known, except in manufactories. Chemistry in its turn would unfold the principles on which the various operations are founded, concerning which even the artists themselves are generally observed to be grossly ignorant.

It seems evident, that no material change can be wrought in bodies, but either by separating something from them, or combining something with them; but it is by chemical attraction, that both separation and combination are performed. Consequently it is from the accurate knowledge of chemical laws, that the clearest lights, and ablest assistances, are to be obtained.

Knowledge, says the illustrious VERULAM, is incomplete, and scarcely deserves the name, unless it enables us to explain the several phenomena.

Is it not surprizing then, considering the rapid progress which chemical science has been making for some years past, that its professors have not till very lately pointed out its applications to the improvement of agriculture, and rural œconomy? The late ingenious Dr. LEWIS, in his Philosophical Commerce of the Arts, suggested many useful hints towards the improvement of various arts and manufactures by chemical inquiries: And it is much to be regretted, that these have not been pursued, and extended by his successors, with a particular reference to agriculture.

A course of lectures on this plan, delivered in a plain, familiar style, would be a great national acquisition, and convey the most interesting information to various ranks of men, and particularly to the country gentleman, the intelligent farmer, and curious artizan. Few there are, it is hoped, but will readily spare a small portion of the time that is generally devoted to the bottle or the chace, to partake of so useful, so elegant an amusement.

If a scheme of this nature ever was necessary, it seems to be peculiarly so at this juncture. Since we have been stript of our American colonies, and many sources of our wealth and commerce been diverted into other channels, it surely behoves us to
employ

employ those which remain to the best advantage. If any thing can still enable us to support our present enormous burthens, or maintain our national character, it must be *a strict attention to the improvement of Agriculture, and useful Arts.*

While our jealous rivals the French, intent on these great national objects, are exerting every nerve to outstrip us, by issuing royal bounties, and offering every flattering inducement that can kindle zeal, excite industry, or exercise ingenuity, shall we continue to indulge a fatal lethargy, and give ourselves up to indolence and dissipation?

Had one fiftieth part of the treasure which has been annually expended in raising and supporting distant colonies, or even one thousandth part of what has been still more wantonly lavished away, in carrying on the late ill-fated, ruinous war, been devoted to this truly patriotic purpose, the advantages would have soon been very apparent, and would most amply have repaid the expence.

Great-Britain might then, with its appendages, have justly excited the envy of all the surrounding nations, and long remained unrivalled in arts, as well as in arms!

Walcot-Parade, Bath,
Oct. 19th, 1785.

A. FOTHERGILL.

ARTICLE VII.

On the Half Husbandry.

[By the Rev. H. J. CLOSE, Trimley, Suffolk.]

THE following account of the culture and produce of a small piece of lucern, and also the half crop of oats with the potatoes planted in the intervals, shall have at least the merit of exactness, however unworthy of communication in other respects.

April the 30th, 1782; sowed half a pound of lucern in a seed bed, the drills being drawn with a garden hoe, at six inches distance, and covered with a rake.

September the 24th following, took up the plants, cut the tap-roots off, leaving each root about three inches long, and transplanted them into a piece of good mixed soil land, containing two roods, sixteen rods, leaving room for ploughing the intervals, as it was planted two feet two inches from row to row, and ten inches from plant to plant in each row.

In the year 1783, it yielded four crops, which were cut and given to the horses in the yards, the weight

weight of which cannot be ascertained ; but in the year 1784, I had it all weighed, and kept an account of the produce, which was as follows :

<i>Crops.</i>	<i>Began cutting.</i>	<i>Finished cutting.</i>	<i>Produce.</i> <i>lb.</i>
1st crop	May 17th	May 25th	3442
2d	June 28th	July 15th	5064
3d	August 2d	August 14th	4831
4th	September 7th	Sept. 14th	3698
The 5th crop was not half of it cut, the frost			
set in so early, but the part that was cut			
produced - - - - -			
			775
Set the part which was fed off at the same			
weight, though it certainly exceeded it			
			775
The whole will amount to			<u>18185</u>

Or 8 tons, 2 hundreds, and 41 pounds of green food, from somewhat more than half an acre.

The lucern is now two feet high, and I have begun to mow it; though from the backwardness of the spring there is no other grass even fit to turn into, and the whole neighbourhood is destitute of food for their cattle.

The experiment on the oats and potatoes was tried the same year. An acre of mixed loamy land was ploughed three times after a crop of cabbages, and on April 28th, 1784, half of it was set with the best Poland oats, planting two feet two inches,
and

and leaving the same space as intervals. May the 12th, those intervals were split with a double-breasted plough, and planted with Champion potatoes. August the 29th, the oats were cut; and then threshed, yielded ten coombs or five quarters of extraordinary large, heavy grain. October the 5th, the potatoes were ploughed up, and produced thirty sacks of very fine potatoes, half of which were sold at six shillings per sack, and half at seven. The potatoe land was immediately planted with wheat, which now looks well, and promises to be my best crop.

The oat stubble, after having several ploughings, was, on the 16th of April last, planted with potatoes. The frame used for planting the oats had five tines or teeth in the two feet two inches. The expence of planting or hand hoeing either wheat or oats, is much diminished since the practice was first introduced into this neighbourhood. By an account of mine transmitted to you by Sir Thomas Beevor, you will find 10s. an acre paid for planting wheat, with a seven-tined frame, and the same sum for hand-hoeing; but I can now put it out at 6s. each per acre: using a frame with five tines makes only the difference of two women.

I shall add the produce of the acre of land thus cultivated.

	£.	s.	d.
The 30 sacks of potatoes sold for	-	9	15 0
The 5 quarters of oats for seed	-	5	5 0
		<hr/>	
	£.	15	0 0

Add to this the advantage of having at least half the land in good order for a crop of wheat, and I think it must appear a very advantageous method of culture. How the potatoes on the oat-stubble will succeed, I cannot form any judgment, as I never attempted to grow them after that grain. I have cultivated many acres of wheat and potatoes in the same method with great success.

Your obedient servant,

Trimley, near Ipswich,
May 17th, 1785.

H. J. CLOSE.

P. S. Since the above was written, I have reduced the price of planting wheat or oats with the five-tined frame to 4s. 10½d. per acre. The potatoes on the oat-stubble produced 45 sacks of 3 bushels each from the half acre, and the wheat on the potatoe land was remarkably fine, and promises to be a very great crop, though it is not at present threshed.

Jan. 20, 1786.

ARTICLE VIII.

On the Culture of the Bush-Vetch.

By the Rev. Mr. Swayne, in a Letter to the Secretary.

SIR,

SEVERAL gentlemen at the last meeting, having expressed great surprize at the acreable account of the produce of a piece of lucern in some former season, communicated by the Rev. Mr. Clofe, I here send you a similar account of the produce of an indigenous vegetable of this country in the present season; a vegetable, which has hitherto, as far as I know, been uncultivated; but which, if I am not greatly mistaken, would, under proper cultivation, prove a valuable addition to the farmer's Flora, and be in many respects of more value to him than that celebrated exotic, lucern.

The plant which the statement respects is, the Bush Vetch, [*Vicia sepium*, LIN.] It is a plant of the class *diadelphica* of the Linnæan system, the order *decandria*, the genus *vicia*: the sixth species of WITHERING, and the seventh of HUDSON. The root is perennial, fibrous, and branching; the stalks are many, some of them shooting immediately upwards, others creeping just under the surface of the ground, and emerging some near to, and others

at a considerable distance from the parent flock. The small oval leaves are connected together by a midrib, with a tendril at the extremity; the flowers are in shape like those of the common vetch, of a reddish purple colour; the first that blossom usually come in pairs, afterwards to the number of four at a joint; the pods are much shorter than those of the common vetch, larger in proportion to their length, and flatter, and are of a black colour when ripe; the seeds are smaller than those of the cultivated species, some speckled, others of a clay colour.

Being a perennial, it should seem to be a very proper kind to intermix with grass seeds for laying down lands intended for pasture; and that it is as justly entitled to this epithet as any herbaceous plant whatever, I think I may be allowed to affirm, having observed a patch of it growing in one particular spot of my orchard for these fourteen or fifteen years past.

It is not only a perennial, but an evergreen; it shoots the earliest in the spring of any plant eaten by cattle with which I am acquainted, vegetates late in autumn, and continues green through the winter, though the weather be very severe; add to this, that cattle are remarkably fond of it. These
peculi-

peculiarities, it should seem, would make it particularly valuable to the farmer as a green food for his sheep in the winter and spring, when food of that denomination is so exceedingly scarce. Indeed I had often wondered within myself, what could be the reason that this plant had never found its way into general cultivation for this purpose; but since I have been acquainted with some peculiar circumstances attending it, my wonder has ceased.

From these I collect, that the chief reason which has hitherto prevented its cultivation, has been the very great difficulty of procuring good seeds in any quantity. The pods, I find, do not ripen altogether; but as soon almost as they are ripe, they burst with great elasticity, and scatter the seeds around; and after you have procured the seeds, scarce one-third part of them will vegetate, owing to an internal defect, occasioned by certain insects making them the nests and food for their young. Perhaps a detail of the circumstances which led to this discovery, may not be uninteresting.

In the autumn of the year 1782, I collected a quantity of these seeds from the hedges, &c.—March 15th, 1783, I sowed them in drills in a plat of ground in my kitchen garden, which measured exactly five yards square; they were sown in eight

F 3
drills,

drills, as thick in the drills as I would have sown pease. They came up very thin and irregular; in some places there was more than a foot vacancy between plant and plant. This I was much surprised at, as the seed had been carefully preserved during the winter, and I could not, from their appearance at the time of sowing, suspect them to be in the least defective. The plants grew very sparingly till towards the autumn, but before winter they made a tolerable appearance.

This plat is in the most exposed part of my garden; the soil a blackish loam, rather stiff; it had been planted with potatoes the year before, for which I believe it was dunged, but am not certain; the two preceding years it was used as a nursery for Lombardy poplars.

Early in July 1783, I collected some more of these seeds from the hedges, tied them up in a paper, and put them in a drawer of my bureau. Upon opening the paper in September, I observed a vast number of dead flies in it, and as many of the seeds with a small hole in each. The number of the flies was 280. The whole number of the seeds 1080. These flies, upon examination, proved to be a small species of ichneumon. This puzzled me not a little, as I had learnt that these insects were
 termed

termed a race of cannibals, from their larvæ or caterpillars always feeding on other insects. Upon which I opened many of the other feeds that had no holes in them, and in several of these discovered another insect, alive, and in different states of its growth. This proved to be the *bruchus pisi* of Linnæus, a near relation of the weevil [*curculio*] and the attelabus. From hence I surmised, that at the time when the bush-vetch blossoms the female bruchus lays her egg within the blossom, and the ichneumon immediately after deposits her egg in the same place.

After the frosts were over, I was much pleased to observe, that scarce a plant of my vetches had been killed by them, and their verdure very little injured. In April 1784, they had entirely filled up the ground, and were beginning to flower; at this time I found, as I expected, numbers of the bruchi intruding themselves into the blossoms, before they were scarcely open, and the attendant ichneumones ready to follow them. I used every method I could think of to chase away these insects from my crop, by strewing foot over, kindling smoaky fires around, &c. but all to no purpose.

In the beginning of May the vetches were in full blossom, and it was amazing to see what a croud
of

of insects were swarming about them. At that time, I intended to preserve the vetches for seed; but some time after, observing that they were beginning to rot from their over-luxuriance, I cut them, without taking any particular account of the produce. They were cut twice afterwards during the summer. Having remarked in general that the produce of these cuttings was very great, I was determined this year to keep a particular account.

Accordingly, March 16, 1785, I began to cut the vetches for the first time this season. This cutting weighed green 16lb. I did not dry any part of it, but must suppose, that if dried, it would have weighed at least one-fourth, as it was not near so succulent as any of the after-cuttings.

May 17th, they were cut a second time, in full blossom, and weighed 130 pounds;—36lb. of the green fodder weighed when dry six pounds.

July 21st, they were cut a third time, and weighed 62lb.—33½lb. green weighed 8lb. dry.

Sept. 30th, they were cut the fourth time, and weighed green 72½lb.—15lb. green weighed 2½lb. dry.

The whole plat then of twenty-five square yards produced,

	<i>lb.</i>		<i>lb.</i>
1st cutting	16 green	supposed	4 dry
2d ditto	130 ditto, would have weighed	21½	dry
3d ditto	62 ditto, would have weighed	14	dry
4th ditto	76½ ditto, would have weighed	12½	dry
<hr/> Total 284½ green		<hr/> 52 dry.	

An acre therefore, (reckoning 4840 square yards to the acre) in the same circumstances, would have produced the total amount of •

<i>Tons.</i>	<i>cwt.</i>	<i>qrs.</i>	<i>lb.</i>
24	11	3	3 green
4	9	3	15 dry fodder.

N. B. You are to recollect, that at the time the first cutting was made, there was scarce a green blade of grafs to be seen; and that the season, till after the third cutting, was as unfavourable to vegetation as perhaps any in the memory of man.

Your obliged humble servant,

Pucklechurch,
October 13, 1785.

G. SWAYNE.

ARTICLE IX.

On the superior Advantage of Dairy to Arable Farms.

[By THOMAS DAVIS, esq; of Longleat.]

GENTLEMEN,

EXPERIENCE sufficiently evinces the extreme difficulty of persuading *tenants* to believe that they get more (generally speaking) by *feeding* their lands, than by ploughing them; yet it requires very few arguments to convince a *landlord*, that, in cold wet lands especially, the less ploughed land you have, the less you put it in a *tenant's* power to ruin your estate. That a tenant of 60*l.* per annum in a dairy farm will get money, while a corn farm of the same size will starve its occupier,* (though perhaps the former gives 15*s.* per acre for his land, and the other but 10*s.*) is self-evident;—not to mention, that not only the increased price of butter and cheese, but the difficulty in many parishes of getting even a pint of milk, an article so salutary and so necessary to subsistence in our early years, call aloud for every encouragement to be given to the pail.

The plough is a friend of every body's, though its advantages are very far from being particularly

* We perfectly agree with Mr. Davis, that this is the case in all small arable farms.

and

and locally felt; corn being an article that will bear keeping till the whim or caprice, or supposed advantage, of its possessor call it forth. But the produce of the cow is far otherwise. Cheese must necessarily be sold at a certain period; it is a ponderous article, and one-twelfth, or at least fifteenth, of its value is often paid for carrying it to a fair fifty miles off; and the butter and skimm'd milk find their way no great distance from home, as is evident by the price of butter varying frequently one-third in twenty or thirty miles.

Every inhabitant of the city of Bath must be sensible, that butter and cheese have risen one-third or more in price within twenty years. Is not this owing to the great encouragement given to the plough, and to grazing, at a time when, on account of the increased demand for milk, cream, butter, and cheese, every exertion on behalf of the dairy should have been encouraged?

In Dorsetshire, the farmers take *all* the cream from their cheese, and yet think it equally delicious to the rich kinds made in Somersetshire, where it is thought high treason to take any.—The difference at market may perhaps be five or six shillings; and yet I well know, that the butter thus stolen from the cheese is frequently equal to 12s. on every hundred weight of cheese.

Suppose

Suppose then the Society were to offer a premium† for the best course of experiments upon the comparative value of butter and cheese.

- 1st. Butter from new milk alone.
- 2^{dly}. Butter from half new milk and half whey.
- 3^{dly}. Butter from whey alone.
- 4^{tly}. Cheese from new milk.
- 5^{tly}. Cheese from half-skimm'd milk.
- 6^{tly}. Cheese from all skimm'd milk.

But I am really ashamed to have said thus much to you, who are so much better judges, and must have long since made up your mind on every material branch of agriculture, and become acquainted with the comparative advantages and disadvantages arising from the different modes of practice in different counties.

I am, &c.

Longleat.

THOMAS DAVIS.

† The Society in their premiums this year [1785] have not been wholly inattentive to the very pertinent hints suggested by Mr. Davis; and they wish him to be assured, that his correspondence will, at all times, be particularly acceptable.

ARTICLE

ARTICLE X.

Remarks on the foregoing Letter.

[By JOHN BILLINGSLEY, esq; of Ashwick-Grove.]

SIR,

I HAVE perused Mr. Davis's letter with some considerable degree of attention; but must confess myself somewhat at a loss how to form a premium on the management of a dairy. I perfectly agree with him in respect to the importance of the subject; but it is of so complicated a nature, that, I am of opinion, no settled invariable rules for the management of the dairy can with any propriety be established. The vicinage of a city or considerable market-town; the residence of a populous neighbourhood; the nature of the pasture on which cows are fed; all contribute to dictate a variety of management, without an attention to which the farmer's profit will be undoubtedly diminished.

In places where butter may be sold throughout the year on an average at seven-pence or eight-pence per pound, I have found the most profitable method to be, that of making butter, and *half* skimmed cheese. In this way (on our land, which may be valued at from 20s. to 25s. per acre) six or seven pounds may be annually made from a good cow; allowing her the produce of two acres and a
half

half for her summer and winter feed. The difference of price between this kind of cheese, and the best sort, cannot be estimated at least than 8s. per hundred weight. This declaration may probably surprise you, when you compare it with Mr. Davis's account of the Dorsetshire method, where, he says, they "take all the cream from the cheese, and yet the difference of price at market is only "5 or 6 shillings per hundred weight."

Perhaps there cannot be a stronger proof of the inferiority of the plough, with respect to profit, than the superior punctuality of the dairy farmer in the payment of his rent. This observation, I believe, most stewards, who superintend manors devoted partly to corn and partly to dairy farms, will verify;—at least, I have never met with one who controverts it.

But perhaps the advocate for the plough will desire me not to confound the abuse of a thing with its intrinsic excellence—and say, that the generality of corn farmers are most egregious slovens;—that lands devoted to the plough are not confined to such a mediocrity of profits as 20s. an acre;—that the produce of artificial grasses (without which a well-managed arable farm cannot exist) far exceeds that of natural grass, both in respect of quantity
and

and nutrition;—that the straw-yard is a most convenient place of reception for the cow when freed from the pail. These and many other reasons may be adduced, to shew the propriety of walking in the middle path, and of judiciously blending *arable* with *pasture*, in the proportion perhaps of *three* of the latter to *one* of the former.

Sir Thomas Beevor's letter is a treat, for which I return you my most cordial thanks. In him we see happily combined the polite gentleman and the practical farmer. His method of cultivating turnip-rooted cabbages,† I have myself practised with great success, and join with him in warmly recommending it to the notice of all farmers.

I am, &c.

JOHN BILLINGSLEY.

Abbwick-Grove, Nov. 14, 1784.

ARTICLE XI.

On the Culture of Carrots.

[By JOHN KIRBY, esq; in a Letter to the Secretary.]

I HAVE been favoured with your letter, enquiring after the method adopted in this county for the cultivation of carrots; and shall think myself

† See Article XVII.

particularly happy if the intelligence I am enabled to communicate upon that subject, should be thought worthy the attention of your very respectable Society, or in the least degree tend to promote the good intentions of so laudable an institution.

The soil proper for the cultivation of this useful root is a sandy loam, of about seven or eight shillings per acre; that on which I have usually grown them is of a sharper nature, and not so valuable. I have variously sown them after turnips, summerland barley, and pease set upon a rye-grass ley; the crop upon the first has generally been most productive; next to that I should prefer the latter. In the first instance we feed off the turnips by the beginning of February, and then lay the land up on small balks or furrows, in which state it remains until the second week in March, when it is harrowed down, double-furrowed to the depth of about twelve inches, and the seed sown thereon, at the rate of four pounds and an half to the acre. As soon as the plants appear distinctly, they are set out with a small hoe, at the distance of six inches from each other; they are afterwards hoed twice more at different times, according as the crop seems to require it; and it is not unusual to harrow them between the hoeings, which does no injury to the root, and frequently saves the expence of a third hoeing: for these

these three hoeings I commonly pay from fifteen to eighteen shillings per acre.

When carrots are intended to be sown after pease, I usually plough the stubble as soon as the harvest is over, in order that the land may purge itself of weeds; in December it is laid up in small balks to receive the benefit of the frosts; in February it is harrowed down, and manured at the rate of fifteen loads per acre; the manure is ploughed in to the depth of about four inches, and in the middle of March the land is double furrowed, and the seed sown. By pursuing of this method, the manure lies in the centre of the soil, and not only affords nourishment and support to the carrot in its perpendicular progress, but renders it easy to be turned up by a single ploughing, and greatly promotes the growth of the succeeding crop of barley. With this crop I usually lay down the land with rye-grass, in which state it remains for two years before it is again ploughed up, and sometimes longer.

The carrots being fit to take up, I put them out to my labourers, sometimes by the acre, and sometimes by the load, containing forty bushels; for the former, if a good crop, I pay for taking up and topping ten shillings and six-pence per acre; for

the latter, from one shilling to one shilling and two-pence per load, taking particular care of the tops, which are equally valuable with the roots for cows, sheep, and swine. After the carrots are taken up, I lay them in an out-house, and cover them well with straw, to guard them against the frost, though it is not unusual for some farmers to let them continue in the ground until they are wanted, which is less expensive; and the weather must be extremely severe to injure the crown of the root, which is more hardy than either a turnip or potatoe. There is only one objection to which this practice appears to be liable, viz. that of the ground being sometimes rendered too hard by the frost to admit of their being taken up; but this may easily be obviated, by a little care and attention in the grower.

Respecting the weight of an acre of carrots, I confess my curiosity has not yet extended so far as to determine that point; but as to the quantity, I usually grow from 200 to 500 bushels per acre, which we sell at six-pence per bushel.

JOHN KIRBY.

Ipswich, Feb. 4, 1785.



ARTICLE XII.

On Planting in the Rows of new and upland Inclosures.

[By Mr. JOHN WAGSTAFF, Norwich.]

HAVING often seen and regretted the nakedness that appears in the hedge-rows of new and upland inclosures, I thought an expedient in planting might be hit upon to raise prosperous trees, that would at once decorate and improve such inclosures. That which appeared most likely to prove advantageous was the *black*, or as it is sometimes called, the *red wood poplar* [*populus nigra*.] This species will quickly grow to valuable timber; and when intermixed in the rows with the *populus alba*, [abele] makes a beautiful appearance. I observed in one particular situation a tree of the latter kind, which its proprietor (who knew not how it came there) called by the name of the *Dutch beech*. With the farmer's permission, I lopp'd numerous cuttings or small stands of the former, and many such from the latter, which had been for some years propagated in my own plantations. The general length of these stands was from five to seven feet. I planted them in the following method, on the boundary of a piece of upland heath-ground, to be inclosed early in the spring, before the foliation of any leaves could take place.

Upon the interior edge of the intended ditch, holes were made about ten inches deep, and two feet from its brow; and their contents (the turf excepted) were thrown off. In these holes the cuttings were placed, and a spade full or two of earth, from different soils previously mixed for the purpose, filled up the holes, and fixed the cuttings firmly. Upon opening the ditch soon after planting them, I had the turfs piled round each about a foot above the level. After this the contents of the ditch were thrown up to form the bank, which left the stands in the middle of it. This was the whole process respecting them. A layer of quick was then planted, and the bank guarded with thorns. These cuttings generally succeeded, and have grown in height at least two feet annually since planting, which was in the spring 1782, and now measure from ten to twelve feet from the slope of the bank, with their branches so enlarged and extended, as gives me reason to expect that in two more winters they will be equal in size and extent to those cuttings from whence they proceeded. I have extended this mode of planting to several different species of willows, which have also succeeded, but not equal to the poplars.

I have reason to believe, that had these cuttings been larger and longer, they would have thriven
 propor-

proportionably; having about twelve years since planted truncheons of both these pieces of poplar (perhaps nine feet long, and about the circumference of a common hop-pole) on a gravelly bank of a stream, (but some yards from the current of water) which are now in girth from 24 to 28 inches, five feet from the ground; and in height equal to many oaks taken down for timber.

Aug. 31, 1785.

J. WAGSTAFFE.

[N. B. It may probably be objected to the practice of raising large trees in hedge-rows, that the crops of grain receive injury from their roots and shade; but from trees of the poplar class, no hurt can arise; every thing thrives under their shade; and few species of wood are more profitable, as well from the quickness of its growth, as for its many useful and valuable properties. The timber is incomparable for turner's ware, bellows, and heels for women's shoes, and many uses in the farm-yard and its appendages, light carts, &c. By EVELYN and MILLER it is recommended as a very excellent wood (especially the abele kind) for floors, and wainscoting rooms; being less subject to shrink or swell from the influence of a moist or dry air than most others,

Dr. HUNTER observes, (and we have seen the observation confirmed by experiments) that by the quick growth of these trees, and their value when cut, boggy or marshy ground planted with them will produce more per acre than the best pasture or feeding land.]

ARTICLE XIII.

On various Articles of Essex Husbandry.

[By the Rev. Mr. ONLEY, in a Letter to the Secretary.]

SIR,

I AM confident that in general, for any beneficial purpose, grazing is the farming of gentlemen. But where, as with us, hay sells high, it is necessary, and probably in general more profitable, to have one-fourth of the land in four fields arable, for a supply of winter and spring artificial pasturage. The coach-horses of any private family, without any material restraint, will conduct this business under one good *farming* servant; and the heavy expence of many labourers, and a team, which none but a mere farmer can manage to any æconomical purpose, and whose attention for a necessary return must continually be applied to matters of the *lowest* kind, will be avoided.

In the disposal of ground, (and even little men, avoiding the expensive whims of taste, may fairly attend to this, as it leads to that gardening neatness, on which *profitable* farming depends) a field or two of perfectly hoed crops form in the ramble a necessary contrast to the grazing grounds, and with good low hedges, a few clumps of plantation,

tion, and, if without material expence it can be had, a little water, make together on any spot, without woods, lawns, lakes, or temples, an ornamented farm within the reach of every country gentleman, who may satisfy his honest pride, and not injure (nay, probably improve) his fair income.

That hoed crops will on most lands answer the purpose of fallows, is at least most probable; but as this management cannot be effectual on heavy ones, but at a large expence, and the return from the chance of seasons may not be greater on the whole than from fallowing after every third or fourth crop, which is a rough but sure mode of preparing his land; no common farmer will venture the necessary expence, nor consequently can by lease be entrusted with the privilege of constant cropping. With us three crops are allowed in succession, provided beans, pease, turnips, each at least twice well hoed, or clover, be one of the crops, and then fallow.

On this plan our farmers cultivate one hundred acres of strong, moist, arable land, at the expence of four moderate horses only;* plough with a pair

* Many of our correspondents doubt whether four horses can properly cultivate one hundred acres of moist arable land, as the time for working the allows is often much shortened by the precariousness of our climate.

a-breast an acre a day, and rise clover enough for summer; and, by two or three hoeings, turnips enough for winter, to maintain probably as many cattle, as in the beginning of this century were fed on their whole farms; many of which, I apprehend, were then little more than rough cow-pastures. Our medium crops, about three quarters of wheat, four quarters of barley and oats, three quarters of beans and pease, per acre. Rent, rates, and tithe, about 1l. 1s. per acre.

We have no delicate instruments: a few have a double-breasted plough to earth up betwixt the beans. Our hoeing is entirely by hand; the two hoeings of beans, pease, or turnips, nine shillings per acre, without beer. In general a third slight hoeing is essential, and pays well; as these stronger soils, thus pulverized, and richly dunged, and the turnips not left nearer than at a foot square, grow them to a great bulk.

I once presented to the late most worthy representative of Colchester, Mr. GRAY, a specimen of three turnips, that weighed twenty pounds each, from an acre where one with another every turnip was conjectured to weigh six pounds. Six stalled Scots were fattened from four acres. The only drawback is from the chance of seasons, either in
feeding

feeding on, or carting off the turnips from these soils; the injuring the produce of the succeeding crop, especially barley, by not being able to form a fine sowing tilth. The land therefore must be very early cleared; and consequently a mode of drawing and preserving turnips, would be of the greatest benefit to us.

A tenant of my own, and my immediate neighbour, is, in soil, cropping, produce, and labour, an instance, not here in the least singular, of what I have advanced; his four horses, very far from strong ones, (for with us there is an absurd carelessness in this point) cultivate thus one hundred arable strong acres. As a pair more, *all* hazard, decay, and expence included, could not be kept under 20*l.* per annum; at the end of a twenty-one years' lease, such a man, by keeping only the bare number sufficient, and working them to the utmost, and avoiding the parade of a tax-horse team, will have saved 420*l.*

Pardon my adding,—that if the legislature had pleased, without any exemption, to have taxed every horse above three years old, at five shillings, or even half of it, per annum, we had *all* been benefited: the state, by a more profitable tax; the farmer, by being compelled to save so much more than his tax, in reducing his horses to the proportion

tion of their fair work; and the publick, by the feed saved from a useless to a profitable beast.

That oxen on small farms and inclosures would not answer for work, I believe; nor would the saving from the fattening them, afterwards, be so great as at first seems probable; but on large farms and heavy cartage, they must surely be very profitable, comparatively with an expensive team of horses; through the scandalous number of which, and the luxurious mode of using and supporting them, a very large portion of our best pasturage is thrown away; a crop of oats made as valuable as one of barley; and, be our export of wheat and malt again ever so productive, a melancholy deduction to be made on its neat produce, by the quantity of oats annually imported to answer our most prodigal consumption.

That you may not imagine me to have an itch at haranguing upon evils, without forming some practical scheme to counteract them, I send you a course of twenty-one successive crops, in which no two corn crops succeed each other, but are constantly separated by either pulse or herbage. In such a succession, the beans, pease, and turnips, must be very neatly three times hoed; the wheat once. The land richly dunged for turnips; the clover and tares *fed* off; and the plough turned
into

into the land as soon as possible after each crop, in order to form a partial fallow for what is so quickly to succeed it.

A Course of Crops of Twenty-one Years, beginning and ending with a compleat Fallow, with the Produce, and its Value per Acre.

<i>Crops.</i>	<i>Produce per quarter.</i>	<i>Value.</i>		
		£.	s.	d.
Fallow		5	0	0
1. Barley	5 quarters at 1l. per qr.	5	0	0
2. Clover	per acre	2	0	0
3. Wheat	3 at 2l.	6	0	0
4. Turnips	per acre	*2	0	0
5. Oats	4 at 15s.	3	0	0
6. Beans	3 at 1l.	3	0	0
7. Barley	4 at 1l.	4	0	0
8. Pease	3 at 1l.	3	0	0
9. Wheat	3 at 2l.	6	0	0
10. Winter-tares	per acre	2	0	0
11. Barley	4 at 1l.	4	0	0
12. Clover	per acre	2	0	0
13. Wheat	3 at 2l.	6	0	0
14. Turnips	per acre	2	0	0
15. Oats	4 at 15s.	3	0	0
16. Pease	3 at 1l.	3	0	0
17. Wheat	3 at 2l.	6	0	0
18. Winter-tares	per acre	2	0	0
19. Barley	4 at 1l.	4	0	0
20. Beans	3 at 1l.	3	0	0
21. Wheat	3 at 2l.	6	0	0
Fallow				

In 23 years—Total £.77 0 0

Or, within a shilling, 3l. 7s. per acre per annum.

The value of turnip crops in Essex is generally 3l. sometimes more, per acre.

As I have brought the medium quantity and price of each crop to the same round sum, it may not be thought exact; in the former, I conjecture, I have not exceeded; and believe, that in such a course, on proper land, however the produce might annually vary, the total profit *on the whole* would at the end of the period be gained. The expence of such a course of cultivation depends so much on local and temporary circumstances, on the nature of soil, state of seasons, &c. that it is best left to every one's own calculation.

I begin with an additional quarter of barley per acre, as on our heavy lands a fallow is *supposed* necessary for that crop, and to pay by the increased produce. But *in general*, on friable land, I see no reason why the hoe and the plough, when effectually and quickly used, and where capital, spirit, and attention, are not wanting, and the *quantity* of land *not superior* to these exertions, should not *always beneficially* supersede the necessity of a fallow; which, however excused, is too often only ignorance, obstinacy, timidity, or parsimony disguised; nor why a *long* lease, with a restraint on the *four last* years, might not permit a succession of crops so cultivated. Under such restrictions the produce of the tenant, however quick, would be the landlord's profit as well as his own.

On light lands, turnips, barley, clover, and wheat, [*the Norfolk course*] form a most profitable succession; but in time even *these* lands seem surfeited, with the clover at least; and trefoil, and ray-grass, are obliged to be used to gain a swarth. With us wheat at every fourth, or certainly every fifth year, is thought a necessary profit.

In the preceding rotation, I have given, as the most productive, five crops of wheat, and four of barley, and two of every other; so that the variety, and chance of lasting benefit, seems as great as common farming will admit of:

Ignorant as I am in practical husbandry, I venture these observations from a thorough conviction, that a most liberal encouragement of agriculture, and *unrestrained* sale of its produce, is ultimately the only sure means of promoting manufactures, commerce, and population; and that if, instead of the policy inevitably fatal to a free and commercial state, furnished with such a variety of native products, of extending dominion, and forcing trade, similar encouragement had been given towards colonizing and cultivating our waste lands; every man would have kept at home, and such inducements would have made him equally industrious there, in his produce and expenditure. This would have
produced

produced double the return to the community, to that of any vagrant whom poverty or speculation ever carried to gain bread or improve his fortune abroad.

I am, Sir,

Your very obedient servant,

Stifted-Hall, Essex,

CHA. ONLEY.

Aug. 14, 1784.

ARTICLE XIV.

KENTISH AGRICULTURE, (*being Answers to the Society's printed Queries*) transmitted by the Rev. Mr. Hill, of East-Malling, near Maidstone, in Kent.

GENTLEMEN,

IN reply to the Queries sent to me by your Secretary, I send you the following Answers. Permit me to repeat my best wishes for the prosperity of your Society, and the success of their very laudable endeavours to promote the advancement of Agriculture; and to assure you that I am, with great sincerity,

Your most obedient servant,

DANIEL HILL.

East-Malling, July 16, 1785.

Query

Query 1st. What are the kinds of soil from which you generally obtain the best crops of wheat, barley, pease, oats, beans, vetches, turnips, carrots, and cabbages; and what are the usual quantities of seed sown, and the average produce per statute acre, Winchester measure?

Answer. Our best crops are generally obtained from hazel loams; and if they are somewhat stiff and inclining to clay, the better. On such lands, the use of heavy large harrows and rollers in the spring, to break and pulverize the soil, cannot be too much recommended. When the lands are so pulverized, we frequently get of wheat from four to five quarters, beans from five to seven quarters, barley and oats six and often seven quarters per acre.

The quantity of seed generally sown per acre, is, of beans, pease, wheat,* and barley, three bushels; of oats, from four to five bushels.

Q. 2d. What is the usual course of crops adopted by your best farmers on the different soils?

A. Our best lands never lie fallow; and the order of our crops is,

1. Wheat;
2. Barley, or Oats;

* Is it not surprising, that in a county where Agriculture is arrived to such perfection, farmers should sow three bushels of wheat per acre? Certainly two bushels, even in the broadcast way, would be fully sufficient.

3. Pease

3. Pease, or Beans;—the latter always in rows, hand-hoed twice with a two-inch hoe near and between the beans, horse-hoed twice, and lastly earthed with a horse-hoe. After the beans are off, we plough shallow with a broad share, and harrow up, and burn the weeds if any remain, thus preparing a good tilth for wheat.

On our ordinary, sandy, or stone shattery [stone brash] land, our course of crops is different.

1. Wheat.

After that, (before Michaelmas) sow winter vetches or rye, and eat them off with sheep and bullocks in the spring.

Then plough for turnips three or four times, each time harrowing off and burning the weeds; then lay on forty cart-loads of dung per acre. We always carefully hand-hoe the turnips, as the charge is amply repaid by the crop. Sometimes, in a kindly season, we get a good crop of turnips after early pease.

Oats and barley will produce (especially oats) from five to seven quarters per acre, after a good turnip season, and the crop well fed off with sheep, especially if good hay and oil-cake be given them at the same time.

With barley and oats we sow clover; next year wheat, and lastly turnips.

Q. 3d. What manure now generally in use do you find most serviceable, on the following soils respectively, viz. stiff clays, light sand, gravelly, moory, cold and wet, or what is called stone-brash land?—In what quantities are the several manures laid on per acre; at what season; and how long will each last without renewal?

A. On stiff clays or sand, or gravelly cold wet land, lay marle or chalk early in the winter, at the rate of eighty cart-loads per acre, which will last twenty years; besides this, dung and lime is sometimes added.

Q. 4th. Have you discovered any new manure more efficacious than those generally used, and which may easily be obtained in large quantities? If so, what is it, when and how applied?

A. Dung made by fat bullocks fed on hay and oil-cakes, and by sheep fed on the same or turnip lands. Large oxen will eat twenty pounds of oil-cake per day, but Welch heifers will thrive well with half the quantity.

Q. 5th. What is the best top-dressing for cold wet pastures which cannot easily be drained?

A. Wood-ashes, coal-ashes, with fowls or pigeons dung spread thin.

Q. 6th. What materials do you find best and most lasting for covered drains or land ditches?

A. Ragged stones or brickbats, or rather flat stones, two set on edge eight or ten inches asunder, and a third over; and where these cannot be had, black-thorn or other bushes. Some persons use turf with the grass side downwards, leaving a hollow below for the water.

Q. 7th. What are the kinds of wood which you have found from experience to thrive best on bleak barren soils, cold swampy bogs, and black moory ground?

A. Scotch firs on bleak barren soils, especially in a northern aspect. On cold swampy bogs, the Dutch willow will do great things; but ash will succeed better, and is far more useful and profitable.

Q. 8th. What are your methods of raising lucern, sainfoin, and burnet; on what lands do you find them to answer best; and what is the average produce?

A. Lucern succeeds best in drills one foot asunder,* and kept clean by a small plough drawn by

* We apprehend a distance of at least eighteen inches would be better, and occasion less damage to the plants by the horse going between the rows. From various experiments made to ascertain the best distance between the rows of lucern, the finest and heaviest crops have been from rows two feet apart.

one horse. Sainfoin flourishes most on chalky, and dry stone shattery land, on which it will produce two tons per acre on an average, for fourteen or fifteen years. Burnet is in disgrace with us, and generally laid aside as useless.

Q. 9th. How is your turnip husbandry conducted; and what is the best method of preventing or stopping the ravages of the fly on the young plants?

A. The first part of this query is answered in the second: To prevent the ravages of the fly, some good is sometimes done by running a light roller over them, with a bundle of blackthorn fastened behind it.

Q. 10th. Do you prefer the drill to the broadcast method of sowing grain; in what instances, and on what soils?

A. When lands are foul and weedy, the drill is certainly preferable to the broadcast; as by that means, the horse-hoe may be used.

Q. 11th. What is the comparative advantage of using oxen instead of horses in husbandry?

A. Where a farm consists of arable land and good pasture, the use of oxen is deemed preferable

to that of horses, where men can be procured to drive them.

Q. 12th. Omitted.

Q. 13th. What new improvements have you made, or adopted, in implements of husbandry?

A. Our improvements in implements of husbandry have of late years been great and various, particularly in drill ploughs, which, by dropping the seed regularly, and depositing it at a proper depth, save a great deal of grain. Of carts we have a great variety, some for dung made strong with two wheels for two horses, and three wheels for one horse; and others of lighter kinds.

I submitted your queries to a very skilful Farmer, from whom I received the following answers for land of a *middling kind*:—

To the first Query.—We have most wheat, beans, and vetches, if in proper tilth, from stiff land. The most barley, pease, and oats, from a lighter soil. Wheat on an average twenty-eight bushels per acre. We sow three bushels.

One sack of barley sown per acre produces five quarters after turnips. Five bushels of pease per acre produce from three to four quarters. Four bushels

bushels of beans, and five bushels of oats per acre, produce from five to six quarters.

Vetches, &c. fed off, make a good wheat season.

2d Query.—A clean fallow, and sowed with clover; after clover, wheat or beans the ensuing spring on one carth. Turnips on four ploughings and dunged; hand-hoeing twice. Then barley and clover; next wheat.

3d Query.—Our best manure is dung from beasts fattened with oil-cakes, and fit for all soils. We lay on sixty cart-loads per acre, (each cart holding thirty bushels of coal) which, for turnips or wheat, will last six years.

5th Query.—Wood ashes are the best, and will kill rushes.

6th Query.—Green alder poles, such as we use for hops, sixteen or eighteen feet long, two at the bottom and one at top; or green black-thorn covered with heath, or loose stones, will do.

7th, 8th, and 10th Queries.—The same answers as from Mr. HILL.

9th Query.—Four ploughings, sixty cart-loads of dung, and hoe twice.

12th Query.—Kill your sheep as soon as the rot appears.

ARTICLE XV.

An Account of the Culture and Produce of Six Acres of Potatoes, on Land of the Value of 20s. an Acre.

[By JOHN BILLINGSLEY, esq.]

IN the year 1781, this field was in grass, an old turf that had not been ploughed for more than 20 years. First year 1782, black oats on the lay.

EXPENCES.		£.	s.	d.
Ploughing the plot not wider than six inches, and not more than three deep, 10s. per acre	—	3	0	0
Seed five bushels per acre, and sowing	—	4	10	0
Harrowing with blunt short-tined harrow, 2s. per acre	—	0	12	0
Replacing such turf as may have been pulled up by the harrow	—	0	3	0
Mowing, harvesting, and securing, 6s. per acre	—	1	16	0
Getting in, threshing, &c. and winnowing 1s. 6d. per quarter	—	2	5	0
Rent 6l. Tithe 12s.	—	6	12	0
Sundry expences, such as highways, &c.	—	0	6	0
		19 4 0		

PRODUCE.		£.	s.	d.
Thirty quarters of oats at 26s. per qr.	—	39	0	0
N. B. Some sold for 32s.				
Ten loads of straw at 12s.	—	6	0	0
It may be remarked here, that the great profit arises principally from the uncommon prices of oats, which, though sold this year for near 30s. usually are sold for 14s. or 15s. per quarter.				
		45 0 0		
	Expences	19 4 0		
	Profit	25 16 0		

Second year, 1783, Potatoes.

EXPENCES.		£.	s.	d.
1782. Nov. 3. Ploughing the out-stubble, at 4s.		1	4	0
1783. March 7. Another ploughing at 4s.	—	1	4	0
— 25. Harrowing at 2s.	—	0	12	0
30 cart-loads of dung per acre, 3s. per load, halling included	—	27	0	0
April 27. Began planting, and finished the 25th of May, in beds 8 feet wide, and the alley 2½ feet, placed the sets at 1 foot distance on the fallow, then spread the dung on them, after which they were covered 3 or 4 inches with the earth from the alleys, at 26s. per acre	—	7	16	0
Seed from Dumfries in Scotland, (very high price) 5 sacks to an acre, at 14s. per sack	—	21	0	0
June 15. Hoeing at 6s.	—	1	16	0
Aug. 3. Hand-weeding at 4s.	—	1	4	0
Oct. 18. Digging up at 40s. per acre	—	12	0	0
Halling, pitting, thatching, &c.	—	4	0	0
Tithe	—	1	10	0
Rent	—	6	0	0
Sundries, &c.	—	0	6	0
		85	12	

PRODUCE. [Sacks of 240lb. wt.]

Best 550 sacks, say at 4s.	—	110	0	0
Middling 100, at 3s. 6d. per sack	—	17	10	0
Small 50, at 2s. 6d.	—	6	5	0
		133	15	0
Expences		85	12	0
Profit		48	3	0

Which is upwards of 8l. profit per acre, and the land left in excellent order for wheat,

ARTICLE XVI.

On the Culture of Potatoes.

[By the Rev. H. J. CLOSE, Trimley, Suffolk.]

GENTLEMEN,

Nov. 1785.

THE following practical observations on the culture and use of Potatoes, will not, I hope, appear entirely uninteresting. They are the result of various experiments made for five years successively on that valuable root, the growth of which cannot be too much encouraged.

When the potatoe crop has been the only object in view, I have adopted the following method with the greatest success.

The land being well pulverized by two or three good harrowings and ploughings, is then manured with fifteen or twenty cart-loads of dung per acre, before it receives its last earth. Then it is thrown on to what the Suffolk farmers call the *trench balk*, which is narrow and deep ridge work, about fifteen inches from the center of one ridge to the center of the other. Women and children drop the sets in the bottom of every furrow fifteen inches apart; men follow, and cover them with large hoes, a foot in width, pulling the mould down so as to bury
the

the sets five inches deep; they must receive two or three hand-hoeings, and be kept free from weeds; always observing to draw the earth as much as possible to the stems of the young plants. I find, by repeated trials, the first or second week in April the most advantageous time for planting.

In the end of September or the beginning of October, when the haulm becomes withered, they should be ploughed up with a strong double-breasted plough. The workman must be cautioned to set his plough very deep, that he may strike below all the potatoes, to avoid damaging the crop. The women who pick them up, if not carefully attended to, will leave many in the ground, which will prove detrimental to any succeeding corn, whether wheat or barley. To avoid which inconvenience, let the land be harrowed, and turn swine in to glean the few that may be left by their negligence.

By this method, the sets will be fifteen square inches from each other; it will take eighteen bushels to plant an acre; and the produce, if on a good mixed loamy soil, will amount to three hundred bushels.

If the potatoes are grown as a preparation for wheat, I prefer having the rows two feet two inches
from

from each other, hand-hoeing only the space from plant to plant in each row; then turning a small furrow from the inside of each row by a common light plough; and afterwards, with a double-breasted plough with one horse, split the ridge formed by the first ploughing thoroughly to clean the intervals. This work should not be done too deep the first time, to avoid burying the tender plants; but the last earth should be ploughed as deep as possible; and the closer the mould is thrown to the stems of the plants, the more advantageous it will prove. Thus fifteen bushels will plant an acre, and the produce will be about three hundred bushels; but the land, by the summer ploughings, will be prepared to receive seed-wheat immediately, and almost ensure a plentiful crop.

The potatoe sets should be cut a week before planting, with one or two eyes to each, and the pieces not very small; two bushels of fresh-slaked lime should be sown over the surface of the land as soon as planted, which will effectually prevent the attacks of the grub.

The expence attending an acre of potatoes well cultivated in the first method, supposing the rent twenty shillings, tithe and town charges rather high, (as in Suffolk) taking up, and every thing included,

included, will be about six pounds. In the last method, it would be somewhat reduced.

I have many years sold the greatest part of my crops for seven shillings per sack of three bushels; thus the one hundred and twenty sacks would amount to forty-two pounds; but they are now so much cultivated, that to make a fair, and what may be termed a sure estimate, they should be valued only as applicable to the feeding and fattening of cattle. I am convinced from experience, that they are worth three shillings per sack for those purposes, and then the produce would amount to eighteen pounds per acre. They are excellent food for hogs; roasting pork is never so moist and delicate as when fed with potatoes, and killed from the barn-doors without any confinement. For bacon and hams, two bushels of pea-meal should be well incorporated with four bushels of boiled potatoes, which quantity will fat a hog of twelve stone, (fourteen pounds to the stone.) Cows are particularly fond of them: half a bushel at night, and the same proportion in the morning, with a small quantity of hay, is sufficient to keep three cows in full milk; they will yield as much and as sweet butter as the best grass.

In fattening cattle, I allow them all they will eat: a beast of about thirty-five stone will require a
bushel

busnel per day, but will fatten one-third sooner than on turnips. The potatoes should be clean washed, and not given until they are dry. They do not require boiling for any purpose but fattening hogs for bacon, or poultry; the latter eat them greedily. I prefer the champion potatoe to any sort I ever cultivated. They do not answer so well for horses and colts as I expected; (at least they have not with me) though some other gentlemen have approved of them as substitutes for oats.

When predilections for old customs are subdued, I hope to see the potatoe admitted in the constant course of crops, by every spirited husbandman. The most beneficial effects will, I am certain, accrue from such a system. The advantages in my neighbourhood are apparent; I cultivated, and fed my own children upon them, and my poorer neighbours sensibly followed the example. A great proportion of every cottager's garden is now occupied by this root, and it forms a principal part of their diet. Potatoes are cheap and excellent substitutes for pease in soups and broths, allowing double the quantity.

Although it is nearly a transcript of the directions given by a very ingenious author,* yet I shall

* Mr. HANWAY,

take the liberty of inserting a receipt for making a potatoe soup, which I have weekly distributed amongst the poor to their great relief.

				s.	d.
An ox's head	—	—	—	2	6
Two pecks of potatoes	—	—	—	0	6
Quarter of a peck of onions			—	0	3
Three quarters of a pound of salt			—	0	1
An ounce and half of pepper			—	0	3
				<hr/>	
			Total	3	10

Ninety pints of water to be boiled with the above ingredients on a slow fire, until reduced to sixty, will require one peck of coals, value three-pence. I have added the expence of every article according to their prices with me, that gentlemen may nearly perceive at how easy a rate they can feed sixty of their poor neighbours. I find from experience, a pint of this soup, with a small piece of the meat, is sufficient to satisfy a hearty working man with a good meal. If vegetables are plentiful, some of every sort may be added, with a few sweet herbs.

I hope my inserting the above, will not be esteemed improper; though somewhat deviating from the culture of potatoes, it may possibly be a means of rendering them more extensively useful, which is the earnest and sincere wish of

Your friend and servant,

Trimley, near Ipswich.

H. J. CLOSE.

ARTICLE XVII.

On the Culture of Turnip-rooted Cabbage.

[By Sir THOMAS BEEVOR, bart.]

GENTLEMEN,

I AM glad to find, by a letter from your Secretary, that the importance and value of turnip-rooted cabbages are at length become more generally known, and better ascertained in the Western Counties. I have long experienced the benefit of them for a late spring seed; and last year (which was so unfavourable to all the crops of the common turnips, by the mildew in autumn, and the severe frost in the winter, whereby they became rotten soon after Christmas) has opened the eyes of my neighbours to see the propriety of a practice they had so long overlooked and neglected; I mean the having a portion of the turnip crop of this kind, as I have. The following is my method of cultivating them; and experience convinces me that it is cheaper and better than any other.

In the first or second week in June, I sow the same quantity of seed, hoe the plants at the same size, leave them at the same distance from each other, and treat them in all respects like the common turnip. In this method I have always ob-
tained

tained a plentiful crop of them; to ascertain the value of which, I need only inform you, that on the 23d day of April last, having then two acres left of my crop, sound, and in great perfection, I divided them by fold hurdles into three parts of nearly equal dimensions. Into the first part I put twenty-four small bullocks of about thirty stone weight each (14lb. to the stone) and thirty middle-sized fat wethers, which, at the end of the first week, after they had eaten down the greater part of the leaves, and some part of the roots, I shifted into the second division, and then put seventy lean sheep into what was left of the first; these fed off the remainder of the turnips left by the fat stock; and so they were shifted through the three divisions, the lean stock following the fat as they wanted food, until the whole was consumed.

The twenty-four bullocks, and thirty fat wethers, continued in the turnips until the 21st of May, being exactly four weeks; and the seventy lean sheep until the 29th, which is one day over four weeks: so that the two acres kept me twenty-four small bullocks, and one hundred and ten sheep, four weeks, not reckoning the overplus day of keeping the lean sheep: The value, at the rate of keeping at that season, cannot be estimated in any common year at less than four-pence a week for each

each sheep, and one shilling and six-pence per week for each bullock, which would amount together to the sum of 14l. 10s. 8d. for the two acres.

You will hardly, I conceive, think I have set the price of keeping the stock at too high a rate; it is beneath the price here in almost every spring, and in this last, it would have cost double, could it have been procured; which was so far from being the case, that hundreds of sheep and lambs here were lost, and the rest greatly pinched for want of food.

You will observe, gentlemen, that in the valuation of the crop above-mentioned, I have claimed no allowance for the great benefit the farmer receives by being enabled to suffer his grass to get into a forward growth, nor for the superior quality of these turnips in fattening his stock; both which circumstances must stamp a new and a great additional value upon them. But as their continuance on the land may seem to be injurious to the succeeding crop, and indeed will deprive the farmer totally of either oats or barley; so to supply that loss, I have always sown buck-wheat on the first earth upon the land from which the turnips were thus fed off; allowing one bushel of seed per acre, for which I commonly receive from five to six quarters per acre in return. And that I may not throw that part of
my

my land out of the same course of tillage with the rest, I sow my clover or other grass-seeds with the buck-wheat, in the same manner as with the oat or barley crops, and have always found as good a *layer* [ley] of it afterwards.

Thus you see, that in providing a most incomparable vegetable food for cattle, in that season of the year in which the farmer is generally most distressed, and his cattle almost starved, a considerable profit may likewise be obtained; much beyond what is usually derived from his former practice, by the great produce and price of a crop raised at so easy an expence as that of buck-wheat, which, with us, sells commonly at the same price as barley, oftentimes more, and but very rarely for less.

From repeated trials, I have the confidence to believe, no farmer will ever have cause to repent adopting the practice I have recommended. It will ever be found convenient and profitable, although perhaps in many instances not altogether to the degree above-mentioned.

The land on which I have usually sown turnip-rooted cabbages is a dry mixed soil, worth fifteen shillings per acre.

I am, &c.

THOMAS BEEVOR.

Heibel-Hall, Sept. 11, 1784.

VOL. III.

I

ARTICLE XVIII.

Culture, Expences, and Produce of Six Acres of Potatoes, being a fair Part of near Seventy Acres, raised by John Billingsley, esq; for which the Society's Premium was granted him in the year 1784.

EXPENCES.		£. s. d.
P LOUGHING an oat-stubble, in Oct. 1783, at 4s. per acre — —		1 4 0
Cross-ploughing in March 1784		1 4 0
Harrowing 2s. per acre — — —		0 12 0
180 cart-loads of compost manure, 3l. per acre —	18 0 0	
42 sacks of seed potatoes (each sack weighing 240lb.) of the white sort — — —	10 10 0	
Cutting the sets, 6d. per sack — — —	1 1 0	
Setting on ridges eight feet wide (leaving an interval of two feet for an alley) 6d. for every 20 yards	10 12 0	
Hoeing at 5s. per acre — — —	1 10 0	
Digging up the two-feet interval, and throwing the earth on the plants, at 10s. per acre —	3 0 0	
Digging up the crop at 8d. for every 20 yards in length, the breadth being eight feet — — —	14 6 0	
Labour and expence of securing in pits, wear and tear of baskets, straw, reed, spikes, &c. 10s. per acre	3 0 0	
Rent 6l. Tithe 30s. — — —	7 10 0	
	<hr/>	72 9 0
PRODUCE.		
600 sacks of best potatoes, at 4s. per sack —	120 0 0	
120 sacks of middle-sized, 3s. 6d. —	21 0 0	
50 of small, 2s. — — —	5 0 0	
N. B. Each sack 240lb.	<hr/>	146 0 0
Expences	<hr/>	72 9 0
Profit	<hr/>	£. 73 11 0

[Some persons may object to the above price as being too high; but I can assure them, that they are worth more as a food for hogs; beside, I have sold potatoes within the last two years at 12s. per sack, but I never before knew them at so low a price as the present.

At 6s. per sack, the profit would be more than 24l. per acre, and at 8s. per sack, 36l.]

GENTLEMEN,

It may be proper to remark, that the field on which the above experiment was made, was an oat-stubble in the autumn of 1783. In October it was ploughed, and left in a rough state during the winter. In April, it was cross-ploughed and harrowed.

On the 8th of May I began planting, by marking out the field into beds or ridges eight feet wide, leaving a space of two feet wide for an alley between every two ridges. The manure (a compost of stable dung, virgin earth, and scrapings of a turnpike-road) was then brought on the land, and deposited in small heaps on the center of each ridge, in the proportion of about thirty cart-loads to each acre. A trench was then opened with a spade, breadth-way of the ridge, about four inches deep; in this trench the potatoe sets were placed, at the distance of nine inches from each other; the dung was then spread in a trench on the sets, and a space or plot of fourteen inches in breadth dug in upon them.

When the plants were above six inches high, they were carefully hoed, and soon after the two-foot intervals between the ridges were dug, and the contents thrown around the young plants. This refreshment, added to the ample manuring previously bestowed, produced such a luxuriance and rapidity of growth, that no weed could shew its head. I need not add, that the land is now in a state of the highest fertility, perfectly clean, and in most excellent preparation either for wheat or spring corn.

It may be also remarked, that in this mode of planting, a very small space of ground is left unoccupied, and the crop more abundant, than any I ever before experienced.

If this experiment be thought worthy of imitation, and the culture of this excellent root be thereby in any degree extended; it will afford great satisfaction to the Society's well-wisher,

And most obedient servant,

Ashwick-Grove,
November 5, 1784.

J. BILLINGSLEY.

P.S. I did not think it necessary to send particulars of my whole potatoe crop, as it would be in a great measure a recapitulation of the foregoing.

ARTICLE

ARTICLE XIX.

*Account of a Crop of Turnips raised on poor Clay Soil,
between rows of Beans, hand-boed and horse-boed.
With observations on Drilling and Horse-boeing
Turnips.*

[By R. P. ANDERDON, esq; in a letter to the Secretary.]

SIR,

Henlade, Feb. 11, 1784.

THE inspectors having viewed my experimental crop of turnips sown in drills, I now take the opportunity of replying to your queries, and adding a few observations.

The piece of land which this crop grew upon, contains five acres and four perches.

The soil is a poor cold wet clay, with a fall towards the north; value only ten shillings per acre. This was certainly unfavourable to a turnip crop, except by way of experiment, to see what such land would produce in the mode I proposed to cultivate them.

In the year 1782, this field was drilled with turnips, in rows three feet asunder; the season being uncommonly wet, the crop was a very poor one; but the alleys between the rows being horse-hoed, the Lent crop was put in on one earth.

In January 1783, fourteen cart-loads of dung and earth were carried to, and spread upon two parts of the field, which seemed poorer than the rest.

In March, it was ploughed once, and sown with double rows of beans about a foot asunder, with alleys more than three feet wide between the double rows.

In May, the alleys were horse-hoed; and in the beginning of June, rolled with a small spiky roller; then horse-hoed again, harrowed, and sown with turnips the latter end of that month. The crop came up well, but was destroyed by the worm before the plants were in the rough leaf. The same alleys, without any further horse-hoeing or ploughing, were drilled a second time with turnips on the 16th of July, and produced the crop shewed to the Inspectors. This crop was hand-hoed the first time about the middle of August, and a second time about a month after, when the plants were thinned out as near as possible to nine inches asunder, and the alleys moved by going *about* [i. e. up and down] in each of them, with the slim, or Kentish horse-hoe, which promoted the growth of the crop most amazingly. The turnips were of the Norfolk round white kind, having a few of the red mixed with them. The horse-hoeing was done with one horse, at the small expence of six shillings

the

the whole field, not fifteen-pence per acre. The hand-hoeings cost the first time 9s. 4d.; the second time, 6s. 6d. or less than 3s. 5d. per acre. The produce of a square perch, fairly taken, weighed two cwt. 6lb. which is about sixteen tons and a half per acre.

I shall now observe, that the expence of my horse-hoeing, and two hand-hoeings together, have not exceeded what the hand-hoeing alone would have amounted to, had the turnips been sown in the common broadcast method over the whole field;—that the land is in excellent order for a Lent crop on one earth;—and that I believe my crop is much greater than it would have been if sown broadcast, and hoed by hand only, though in the most perfect manner. In *that* way, I doubt whether this field, in its present poor state, would have produced a profitable crop.*

In this mode of sowing, two ounces of seed (if good) would be an ample allowance per acre, if the crop escaped its enemies the *worm* and the *fly*; but if *they* invade it, two pounds may be insufficient. I sowed upwards of fifteen ounces per acre last year each sowing; of the first, scarcely a plant survived; and of the last, scarcely one plant in ten was per-

* Lands of inferior value produce from 30 to 35 tons per acre, only hand-hoed; but it should be observed, that the soil is lighter and sandy.

mitted to remain by the hand-hoers. And as the supernumerary plants are easily pulled out or cut up in hoeing, it is best to drill seed enough to allow for devastation.

Permit me here to enumerate many striking advantages arising from this mode of cultivation in general, and the horse-hoeing part of the process in particular.

First. That you may have a crop of beans and of turnips on the same land the same year.*

2dly. The Bean crop being well horse-hoed, no ploughing is wanted for turnips, for which the best Norfolk farmers give five ploughings.†

3dly. It is hoed cheaper, more effectually, and consequently more profitably, than in any other way.

4thly. The ground is kept clean from weeds.

5thly. It is in order for a Lent crop the succeeding year, with one earth.

6thly. The ground is kept in heart, if not improved, by fallowing your alleys.

7thly. It brings the plant to perfection in poor ground, where it would not become so otherwise.

* To this there is one principal objection, viz. that the same soil cannot be proper for both crops. Scotch cabbages are better adapted to a bean soil.

† Of late years, rarely more than three, unless the land be full of couch grass.

8thly. It

8thly. It doubles the crop on any ground,* which I have had experience of.

9thly. You have (under Providence) the crops more within your own power in *this*, than in any other method, let the seasons turn out as they will.

10thly. You may have, on the same ground, a bean and a turnip crop annually, if the land be suitable, and you think proper.

11thly. The clay farmer by this mode renders land, which is naturally unfit for turnips, so free and open, by seasonable horse-hoeings, that it will bring that useful plant to great perfection.†

Many of these advantages are peculiar to this mode of cultivation, exclusive of, and superadded to, those that attend the turnip crop itself.

But setting these superior and extraordinary advantages aside for the present, may it not be worth the attention of the Bath Society, to consider how far it may be eligible to offer a premium for the best comparative trial between an acre sown broadcast with turnip seed, and twice hand-hoed; and

* This we cannot help doubting very much, and think Mr. A. too sanguine in his expectations.

† Nothing renders a clay soil so free and open, as to have it exposed to frosts and snow, by being laid up in high ridges in January and February; which, on Mr. A's plan, cannot be done; unless the turnips are lessened in value, by being fed off in autumn.

another acre by its side, drilled three feet asunder, the lands being twice hand-hoed, and thinned, and the alleys twice horse-hoed; both acres of land being of equal goodness, and equally prepared.*

At a future day, it may merit their consideration to encourage, by suitable premiums, the production of the best crops that can be got of both beans and turnips, on the same land the same year.

I should have taken notice of the advantages attending a full crop of drilled turnips, sown about Midsummer; which is, that they will be in the ground time enough for two horse-hoings while in the most growing state, which will much enlarge the crop for autumn feeding; for to any one, not acquainted with the effects of horse-hoeing, it will be astonishing.†

It will not be amiss to observe, that although nine inches was a proper distance in my poor land,

* We could have no objection to such a trial; although we have not the least doubt but the weight per acre would be nearly double on the broadcast part, while the other would be increased in expence by the two horse-hoings. It would, in fact, be fallowing *half* the land; which turnips, as a *meliorating* crop, by no means render necessary. They are intended to set aside *all winter fallows*, and on land suitable for them they *do it effectually*.

† We perfectly agree in our opinion with Mr. A. of the advantages of horse-hoeing heavy soils; but such soils should never be sown with turnips, whose tap-roots (by which they are principally nourished) are far below the operation of the hoe in a proper soil, and cannot penetrate a clay. This is proved by the smallness of Mr. A's crop.

yet

yet in a better soil, or in the same when better cultivated and manured, a foot or fourteen inches in the rows would be preferable.

I desire it may be understood, that I do not claim to myself any merit as an *introducer* of drilling in rows, and horse-hoeing turnips; or of drilling them between a crop of beans. I have only happily *adopted* those modes of practice. The *first* was begun by TULL;* has answered well, in Ireland; and I am happy to find, by the *second volume* of your Select Papers, page 368, is already followed by the best farmers in Norfolk.† The *latter* has been successfully used for many years,* by an honest and industrious farmer (Mr. JOHN WILLY) of South-Petherton in this county; and I cannot too earnestly recommend both. For certain I am, that whoever shall carefully attend to them, in a favourable season, will never alter their practice, where prejudice does not prevail.‡

* Although this country is under great obligations to Mr. TULL, whose memory we honour, yet it is well known he carried his scheme of *horse-hoeing* too far. It was his hobby-horse, and he rode it without the curb of reason.

† Our Secretary being last summer in Norfolk, made particular enquiry respecting this, and finds the practice is now totally discontinued; and this, as the Rev. Mr. CLOSE informs us, is the case in Suffolk also.

‡ We cannot help wishing our very ingenious and valuable correspondent Mr. A. a little less sanguine in respect to the advantages of *horse-hoeing* turnips. His crop totally contradicts his theory. Turnips will not, by any mode of culture, succeed well on a poor clay soil. Such lands may be far more advantageously cropped with articles where the horse-hoe will be of much

It gives me pleasure to find by your letter, that hand-hoeing turnips increases in this county and in Wilts. I consider *that* as our greatest improvement of late in Agriculture: but to drill them in rows, then to *band-hoe* and thin them, and afterwards to horse-hoe the intermediate spaces, I look upon to be the perfection of the turnip husbandry.

The horse-hoe, by pulverizing the soil, gives an inexhaustible plenty of pasture to the plants, when the alleys are left sufficiently wide, and the ground is in good heart. I allude to clays, loams, and stone-rush, with which only I have been concerned.

Wishing the Society may perfect the good work they have begun, I remain, Sir, &c.

R. PROCTER ANDERDON.

N. B. The observations on the preceding letter made by the Committee, having been sent to Mr. *Anderdon* previous to their being printed, he obligingly returned the following answer:—

much greater service:—And on good free turnip land, it is certainly improper, as much ground must be lost to admit it. The horse-hoe is adapted to plants that want earthing up, or that have lateral fibrous roots; which is not so much the case with turnips, as with cabbages. Turnips derive no other advantage from it than they would from hand-hoeing, which would sufficiently destroy weeds, and admit of a far greater weight of turnips per acre.

SIR,

" SIR,

" YOU give me the opportunity to correct, or alter, what I had written to you, in respect to drilling and horse-hoeing of turnips, and have sent me the strictures of your Committee thereon. I have revised the former, and read over the latter with attention, and thoroughly considered them both. The result is, I think, they may both continue as they are, with the addition of a few words* only to one article contained in my former letter, and of the following explanation, which I acknowledge to be requisite, and, in my judgment, may be more satisfactory to those who may take the trouble to read the whole, than any other* mode or modification; and more respectful to the Committee, who have given their attention to comment on what I wrote.

" I am easily to be convinced, that in very light sandy ground (on which I have had no experience) the horse-hoe may be of little service; but for such kind of soils on which I have constantly for more than twenty years used the drill and horse-hoe, which are both poor and rich clays, loam, and stone-rush, (alias stone-brash) or a mixture, as in my case, of small lime-stone and a clayey loam, it has produced a surprising effect, and my experience confirms my opinion on such soils.

* These are added in the Letter.

" I have

“ I have asserted it will *double* the crop, and that assertion ought to be explained. I have made many comparative trials on turnips between this mode and broadcast sowing, and always found, on *my ground*, the horse-hoed crops the best. But here, in denoting the benefits of the horse-hoe, by its *doubling* a crop, I wish to be understood, that if, *in soils like mine*, a crop be drilled, leaving proper intervals for horse-hoeing, and one part be horse-hoed, the other not, the horse-hoed part will double the other in product.

“ But, I imagine, the horse-hoe will not suddenly be sufficiently tried for the advantages of it to be generally known, unless (which is more to be wished for, than expected) repeated comparative trials of horse-hoed crops with other modes were to be made under the direction of government, or some publick institution, on all kinds of soils, in every county in the kingdom.* By some such measure alone, the exact point of division between the heavy clay and the light sand, where on one side the horse-hoe would be beneficial, and on the other not, may be explored.

* We are as desirous as Mr. A. can be to see this done ; but the expence attending it would be too great for the finances of provincial societies to defray. If government would allot a few hundred pounds to be solely appropriated by the different societies to experiments of this kind, made in their several districts, and under their immediate inspection, the great question “ on what lands the drill and horse-hoeing husbandry is preferable to the old broad-cast ? ” might, in the course of four or five years, be decisively and satisfactorily determined.

" Your Committee observe, that the same soil cannot be proper for beans and turnips. Doubtless a bean delights most in a heavy loam, a turnip in a light one. But, like taylor, we farmers must cut our coats according to our cloth. Were I to sow no turnips but in a soil the best adapted to them, I could not get a plant, for I have no such soil: but while I can get in single rows, four feet asunder, or more, from half a dozen to half a score tons of turnips per acre, after, or rather between a crop of beans,* in my heavy lands, I shall feel *that produce* here more beneficial than to drop the mode. I believe the medium of the two, so far as I can judge by the eye, or get information, to be superior to the average produce of prepared fallow turnip crops in ten miles round me. As to the friendly wish of your Committee, that I would plant the Scotch cabbage between my beans, I am happy we agree so well in judgment: I have done so this year, in the same field where I have turnips also; but the crop of the latter is so preferable to that of the former, as to induce me to think the cabbage will not get to so great a perfection here, as to be profitably introduced on a large scale, for want of the profusion of dung necessary for that crop, which we cannot procure.

* The question here is, whether if instead of turnips Mr. A. planted his rows of beans two feet distant only, the extra produce of his crop would not have exceeded in value that of his turnips? We think they would; as these intervals would freely admit his horse-hoe between the beans.

I must

I must now remark (with the greatest deference to the judgment of the Committee) that the turnip *has* an abundance of very small *lateral fibrous roots*, which run so far in search of food, and feed as ravenously where they can penetrate, as those of almost any other vegetable, and the plant certainly derives more nourishment from those than from its tap-root.* Those fine fibrous roots, almost imperceptible to the eye, issue chiefly from the apple or body of the turnip, and get into the richest part of the soil, near the surface, and will bring the plants to a considerable magnitude in heavy lands, adapted to beans, when mellowed by the horse-hoe. I have this year had them ten and twelve pounds a piece, from the first sowing, (the 16th of June) which is surely a profitable size: and could I raise only two turnips of ten pounds each on every square-yard, it would yield a crop of forty-three tons an acre.

I must also inform you, that in the same field where my beans stood, I have now wheat very promising; and when my turnips and cabbages are off, I have no doubt, but by the assistance of my friendly horse-hoes, I shall bring the wheat crop to as good maturity at harvest, as any in the country.

* This is not the case with those kinds of turnips which grow chiefly above ground, and which are generally the best crops, and most capable of resisting frosts.

After that I shall avail myself of the good tillage of my ground, and drill winter vetches, assuring myself (from my experience of this year in another field) of a good crop, if the next winter should not be very unfavourable. The following summer [1787] if I live, *after a good dressing*, I intend to drill turnips all over the field, in rows three feet asunder.* The next year [1788] to drill beans in the spring; turnips between them at Midsummer; and wheat where the beans stood at Michaelmas.

Do not therefore discourage me from riding what I perceive you are inclined to call my hobby-horse. I promise you I will not ride him unreasonably. He is a good thing, very tractable, goes very sure, and has done his business well for more than twenty years past—now and then a small trip, or false step, may happen; but it is commonly the fault of the rider, not of the hobby-horse, or horse-hoc.

But to be more serious. Making last summer only two loads of hay from eleven acres of my best meadow, and making in the whole but a small portion, I was from necessity obliged to turn my mind to a supply for the spring, which induced me to sow turnips wherever I could; and in one field I drilled a single row between my drilled wheat on

* Drilling them only two feet asunder is, perhaps, preferable.

the 18th of July;—August the 20th and 22d, I drilled four rows of winter vetches in each interval between the turnips, at the rate of less than one peck and three quarters of seed to an acre. The turnip crop is very acceptable, and my vetches succeed beyond my warmest expectation, are thick enough, and give me the pleasing prospect and hope, that I shall not, when my dry meat is gone, want a seasonable supply of early green fodder, that will last me till my lucerne comes on.

Now please to observe, that though I call in the aid of manure, (which our great master TULL did not) had it not been for the horse-hoeing system, I could not have had two good crops, one of turnips, the other of vetches, so speedily after my wheat; nor either of them to be compared with those I now have. Those vetches, &c. I hope you, or some one of your society, will soon see; for I rather wish my crops should speak for themselves, than by me.

I totally agree with the Committee, that nothing renders a clay soil so free and open, as being laid in high ridges in January and February; in some degree every horse-hoed field does so, and though not in so high a ridge, as in the case of a winter fallow, yet the middles of the alleys are lower than the sides; and last spring I found my ground, after
drilled

drilled beans and turnips, so mellow, that, notwithstanding I intended to have given it three earths, I found it in as fine order with one as any ground I ever seeded with Lent corn; and my oat crop turned out for the season accordingly. I am certain I make double the clear profit of my ploughed ground, that I should do if I followed the common method of tillage, and course of crops, of this county.

It is not to be doubted, if the improvement of our waste lands should take place, but that the horse-hoeing husbandry, at the first outset, will be preferable to any, were it only for the destruction of furze, fern, and other rubbish, which will for years be constantly starting up again, while the crops are growing.

I will conclude with one observation, that having been taught to believe, it is a leading principle in agriculture to make wet ground dry, dry wet, heavy light, and light heavy; I am strongly persuaded, that when the light soils have been manured with marl, clay, lime, or other heavy substances, it will be difficult to find the land, or the turnip crop thereon, in drills three feet asunder, that may not be admirably improved by the horse-hoe, and brought to considerable perfection. And the ex-

periment on a small scale will be neither troublesome nor expensive to any one who has, or can borrow, a drill-plough and horse-hoe.

With great respect, I am,

Your obedient servant,

R. PROCTER ANDERDON.

Henlade, Feb. 9, 1786.

ARTICLE XX.

On the Culture of Beans with Turnips.

In a Letter to the SECRETARY.

SIR,

SINCE I had the pleasure of viewing Mr. ANDERDON's turnips, and making a report thereof to you, I have frequently been considering, whether the method adopted by Mr. ANDERDON, or that generally practised in Norfolk and other counties, (viz. sowing in broadcast, and twice hand-hoeing) might be supposed to be in general of the greatest utility.

This, Sir, appears to me to be a question of considerable importance; and though I am apprehensive it cannot possibly be determined but by repeated accurate experiments, which may not for a long
time

time be obtained, I have taken the liberty to trouble you with a few thoughts that have occurred to me on this subject, in hopes they may meet your approbation, and probably be the occasion of some experiments for the decision of this question.

I will take the liberty to suppose a crop of beans drilled in *single rows* at four feet distance, and the turnips, like Mr. ANDERDON's, drilled in the intervals at a proper season; in order to ascertain the weight, there will then be four rows of seventeen feet in length to make a square perch, whereas the length of Mr. ANDERDON's was only fifteen feet eight inches. This, Sir, will make a difference in the weight of a perch from 230 to 249 pounds; and in the weight of an acre from 16 tons 8cwt. 2qrs. 8lbs. to 17 tons 15cwt. 2qrs. 24lbs.

Each turnip at this distance (*viz.* four feet from row to row, and nine inches in the rows) must occupy a space of three square feet, consequently the greatest number produced in an acre must be 14520; but if sown in broadcast, twice hoed, and the distance on an average 15 inches, each turnip will then occupy but little more than one foot and a half, and the number produced in an acre may be about 27920, which (allowing them to be of the same magnitude) will weigh about thirty-four tons

and four hundred weight. From hence there appears a manifest superiority in favour of the broadcast and hand-hoeing; perhaps of more consequence than the crop of beans (drilled as above) can reasonably be expected to be worth.

Being almost an entire stranger to both these valuable modes of husbandry, I can by no means pretend to ascertain, with any tolerable degree of accuracy, the difference with respect to the expences: but am inclined to think, that the expence of drilling and horse-hoeing the beans, together with drilling the turnips in the manner Mr. ANDERDON did, must be considerably less than that of fallowing and preparing the ground, and sowing the turnips in broadcast; to which may be added another advantage; namely, the facility of hoeing the drills, in comparison of the broadcast.

There is one consideration more in favour of drilling between the beans, which I must confess has considerable weight with me, viz. the great chance, if not an almost certainty, of preserving the turnips from the depredations of the fly; for as Mr. ANDERDON has had several such crops without any damage of that kind, I suppose the beans to be almost a certain preventative.*

* This we doubt; and are inclined to think their escaping the fly proceeded from some other cause.

The principal point in determining this question seems to me to be this: if the crop of beans drilled as above, after deducting the seed, and some additional expence in taking the crop off the ground without injuring the turnips, can be, one year with another, supposed to be as valuable as the quantity of turnips that might reasonably be expected in the broadcast method more than in the other, I should not hesitate to declare my humble opinion in favour of drilling between the beans. .

A very few experiments, carefully made, would, I apprehend, be sufficient to settle this point, and the value of a few such crops of beans would be easily found; but from hence there seems to arise another question, What are turnips worth per ton?

In answer to this, some of your ingenious correspondents have informed us, that a sheep of twenty pounds a quarter will eat twenty pounds of turnips in twenty-four hours. According to this calculation, a ton of turnips will keep one sheep of that size 112 days, or sixteen weeks, which at four-pence per week only is five shillings and four-pence; at which price I imagine they may be fairly valued, after deducting the reasonable expence of drawing and carting them into another field, without doing which they are not nearly so valuable.

Though

Though I have no notion that the communication of these few thoughts to you will be productive of any good effects, unless they should happen to be the means of occasioning a few experiments, I was strongly inclined to trouble you with them; you will therefore be kind enough to excuse the freedom, and believe me to be,

SIR,

Your most obedient humble servant,

THOMAS PAVIER.

West-Monkton, Feb. 23d, 1784.

[Mr. PAVIER's observations discover an attention which is seldom exercised in vain on agricultural subjects; but we wish him to consider that Turnips are by no means well adapted to land suitable for beans. Cabbages would in general pay far better.]

ARTICLE XXI.

On making Butter and Cheese.

[By Mr. HAZARD, of Stoney-Littleton.]

GENTLEMEN,

AS no butter is esteemed equal to that which is made in the county of Essex, and which is well known by the name of Epping butter, and which, in almost every season of the year, will yield
at

at London from one shilling to fourteen-pence per pound averdupoise, I presume it will not be deemed improper to recommend farmers to adopt the method of making such butter; I shall also add what I have gathered from upwards of twenty years experience, part of which time I resided, and occupied a large farm, in the neighbourhood of Epping. I have since been a resident in the county of Somerset. And in both counties we could in general obtain one halfpenny or penny per pound more for our butter than the general market-price.

Before I proceed to point out the method of making the butter, it may not be improper to say something concerning the Dairy-House, which should always be kept in the neatest order, and so situated as that the windows or lattices never front the south, south-east, or south-west; lattices are also to be preferred to windows, as they admit a more free circulation of the air than *glazed* lights possibly can do. It has been objected, that they admit cold air in winter, and the sun in summer; but the remedy is easily obviated, by making a frame the size or somewhat larger than the lattice, and constructing it so as to slide backward and forward at pleasure; pack-thread strained across this frame, and oiled cap paper pasted thereon, will admit the light, and keep out the sun and wind.

It

It is hardly possible in the summer to keep a dairy-house too cool; on which account none should be situated far from a good spring or current of water. They should be neatly paved either with red brick or smooth hard stone, and laid with a proper descent, so that no water may lodge; this pavement should be well washed in the summer every day; and all the utensils belonging to the dairy should be kept perfectly clean; nor should we ever suffer the churns to be scalded in the dairy, as the steam that arises from hot water will injure the milk. Nor do I approve of cheese being kept therein, or rennet for making cheese, or having a cheese-press fixed in a dairy, as the whey and curd will diffuse their acidity throughout the room.

The proper receptacles for milk are earthen pans, or wooden vats or trundles, but none of these should be lined with lead, as that mineral certainly contains a poisonous quality, and may in some degree affect the milk; but if people are so obstinate as to persist in using them, I advise that they never forget to scald them, scrub them well with salt and water, and to dry them thoroughly, before they deposit the milk therein. Indeed all the utensils should be cleaned in like manner before they are used; and if after this they in the least degree smell sour, they must undergo a second scrubbing before they are fit for use.

With

With respect to making of butter, it is right to observe, that the greater the quantity made from a few cows, the greater will be the farmer's profit; therefore ~~he should never keep any but what are~~ esteemed good milkers. A bad cow will be equally expensive in her keep, and will not perhaps (by the butter and cheese that are made from her) bring in more than from three to six pounds a year; whereas a good one will bring from seven to ten pounds per annum: therefore, it is obvious that bad cows should be parted with, and good ones purchased in their room. •

When such are obtained, a good servant should be employed to milk them; as by the neglect and mismanagement of servants, it frequently happens that the best cows are spoiled. I advise no farmer to trust entirely to servants, but sometimes to see themselves that their cows are milked clean; for if any milk be suffered to remain in the udder, the cow will daily give less, till at length she will become dry before the proper time, and the next season she will scarce give milk sufficient to pay for her keep.

It sometimes happens that some of a cow's teats may be scratched or wounded so as to produce foul or corrupted milk; when this is the case, we should by no means mix it with the sweet milk, but give it

it to the pigs; and that which is conveyed to the dairy-house should remain in the pail till it is nearly cool, before it be strained; I mean if the weather be warm; but in frosty weather it should be immediately strained, and a small quantity of boiling water may be mixed with it, which will cause it to produce cream in abundance, and the more so, if the pans or vats have a large surface.

During the hot summer months, it is right to rise with or before the sun, that the cream may be skimm'd from the milk ere the dairy becomes warm; nor should the milk at that season stand longer in the vats, &c. than twenty-four hours, nor be skimm'd in the evening till after sun-set. In winter milk may remain unskimm'd for thirty-six or forty-eight hours; the cream should be deposited in a deep pan, which should be kept during the summer in the coolest part of the dairy; or in a cool cellar where a free air is admitted, which is still better. Where people have not an opportunity of churning every other day, they should shift the cream daily into clean pans, which will keep it cool, but they should never fail to churn at least twice in the week in hot weather; and this work should be done in a morning before the sun appears; taking care to fix the churn where there is a free draught of air. If a pump-churn be to be used,

used, it may be plunged a foot deep into a tub of cold water, and should remain there during the whole time of churning, which will very much harden the butter. A strong rancid flavour will be given to butter, if we churn so near the fire as to heat the wood in the winter season.

After the butter is churned, it should be immediately washed in many different waters, till it is perfectly cleansed from the milk; but here I must remark, that a warm hand will soften it, and make it appear greasy, so that it will be impossible to obtain the best price for it. The cheesemongers use two pieces of wood for their butter; and if those who have a very hot hand were to have such, they might work the butter so as to make it more saleable.

The Epping butter is made up for market in long rolls, weighing a pound each; in the county of Somerset they dish it in half pounds for sale; but if they forget to rub salt round the inside of the dish, it will be difficult to work it so as to make it appear handsome.

Butter will require, and endure, more working in winter than in summer; but I must remark, that I never knew any person whose hand was warm by nature make good butter.

Those

Those who use a pump-churn must endeavour to keep a regular stroke, nor should they admit any person to assist them, except they keep nearly the same stroke; for if they churn more slowly, the butter will in the winter *go back*, as it is called; and if the stroke be more quick and violent in the summer, it will cause a fermentation, by which means the butter will imbibe a very disagreeable flavour.

Where people keep many cows, a barrel-churn is to be preferred; but if this be not kept very clean, the bad effects will be discovered in the butter; nor must we forget to shift the situation of the churn when we use it, I mean as the seasons alter, so as to fix it in a warm place in winter, and where there is a free air in summer.

In many parts of this kingdom they colour their butter in winter, but this adds nothing to its goodness; and it rarely happens that the farmers in or near Epping use any colour; but when they do, it is very innocent. They procure some sound carrots, whose juice they express through a sieve, and mix with the cream when it enters the churn, which makes it appear like May butter; nor do they at any time use much salt, though a little is absolutely necessary.

As they make in that county but very little cheese, so of course very little whey butter is made, nor do I wish any person to make it, except for present use, as it will not keep good more than two days; and the whey will turn to better account to fatten pigs with; nothing feeds them faster, nor will any thing make them so delicately white. But I must observe, that no good bacon can be made from pigs thus fatted; where much butter is made, good cheese for servants may be obtained from skimm'd milk, and the whey will afterwards do for store pigs.

The foregoing rules will suffice for making good butter in any county; but as some people are partial to the *West-Country* method, I shall describe it as briefly as possible.

In the first place they deposit their milk in earthen pans in their dairy-house, and (after they have stood twelve hours in the summer, and double that space in the winter) they remove them to stoves made for that purpose, which stoves are filled with hot embers; on these they remain till bubbles rise, and the cream changes its colour; it is then deemed heated enough, and this they call scalded cream; it is afterwards removed steadily to the dairy, where it remains twelve hours more, and is then skimm'd
from

from the milk, and put into a tub or churn; if it be put into a tub, it is beat well with the hand, ~~and~~ thus they obtain butter; but a cleaner way is to make use of a churn. ~~Some scald it over the fire,~~ but then the smoke is apt to affect it; and in either case, if the pans touch the fire, they will crack or fly, and the milk and cream will be wasted.

The Cambridgeshire salt butter is held in the highest esteem, and is made nearly after the same method as the Epping; and by washing and working the salt from it, the cheesemongers in London often sell it at a high price for fresh butter. They deposit it when made into wooden tubs or firkins, which they expose to the air for two or three weeks, washing them often; but a readier way is to season them with unslaked lime, or a large quantity of salt and water well boiled will do: with this they must be scrubbed several times, and afterwards thrown into cold water, where they should remain three or four days, or till they are wanted; then they should be scrubbed as before, and well rinsed with cold water; but before they receive the butter, care must be taken to rub every part of the inside of the firkin with salt; then if the butter be properly made, and perfectly sweet, it may be gently pressed into the firkin; but it must be well salted when it is made up, and the salt should be equally distributed
through

through the whole mass, and a good handful of salt must be spread on the top of the firkin, after which the head should be immediately put on.

They pursue nearly the same method in Suffolk and Yorkshire; nor is the butter that is made in those counties much inferior to that made in Cambridgeshire; indeed it is often sold in London for Cambridge butter. No people make more butter from their cows than the Yorkshire farmers do, which I am persuaded is owing to the care they take of their cows in the winter; at that season they house them all, feed them with good hay, and never suffer them to go out (except to water) but when the weather is very serene; and when their cows calve, they give them comfortable malt mashes for two or three days after; but these cows never answer if they are removed to other counties, except the same care and attendance be given them, and then none answer better.

Land whereon cows feed very often affects the butter. If wild garlick, charlock, or May weed, be found in pasture grounds, cows should not feed therein till after they have been mown, when such pernicious plants will appear no more till the following spring; but those cows that give milk must not partake of the hay made therefrom, as that will also diffuse its bad qualities.

Great part of the Epping butter is made from cows that feed during the summer months in Epping forest, where the leaves and shrubby plants contribute greatly to the flavour of the butter. The mountains of Wales, the highlands of Scotland, and the moors, commons, and heaths in England, produce excellent butter where it is properly managed; and though not equal in quantity, yet far superior in quality, to that which is produced from the richest meadows; and the land is often blamed when the butter is bad through mismanagement, sluttishness, or inattention.

Turnips and rape affect milk and butter, but brewers' grains are sweet and wholesome food, and will make cows give abundance of milk; yet the cream thereon will be thin, except good hay be given at the same time, after every meal of grains.

Coleworts and cabbages are also excellent food: and if these and favoys were cultivated for this purpose, the farmers in general would find their account in it.

Cows should never be suffered to drink improper water; stagnated pools, water wherein frogs, &c. spawn, common sewers, and ponds that receive the drainings of stables, are improper.

I write

I write all these particulars from my own knowledge, and am well persuaded they may prove useful to those who are not too much bigotted to their own opinion.

C H E E S E.

THE methods of making cheese are so various, that it is not in the power of any person to be acquainted with them all; however, I have selected a few of the best, or those that are in the highest esteem.

The Double Gloucester is a cheese that pleases almost every palate; the best of this kind is made from new, or (as it is called in that and the adjoining counties) *covered milk*; an inferior sort is made from what is called *half-covered milk*; though when any of these cheeses turn out to be good, people are deceived, and often purchase them for the best *covered milk cheese*; but farmers who are honest have them stamped with a piece of wood made in the shape of a heart, so that any person may know them.

It will be every farmer's interest (if he has a sufficient number of cows) to make a large cheese from one meal's milk; this, when brought in warm,

will be easily changed or turned with the rennet; but if the morning or night's milk be to be mixed with that which is fresh from the cow, it will be a longer time before it turns, nor will it change sometimes without being heated over the fire, by which it often gets dust, or foot; nor should I forget smoak, which is sure to give the cheese a very disagreeable flavour.

When the milk is turned, the whey should be carefully strained from the curd, which curd should be broken small with the hands; and when it is equally broken, it must be put by little at a time into the vat, carefully breaking it as it is put in, which vat should be filled an inch or more above the brim, that when the whey is pressed out it may not shrink below the brim; if it does, the cheese will be worth very little. But first, before the curd is put in, a cheese-cloth, or strainer, should be laid at the bottom of the vat, and this should be so large, that when the vat is filled with the curd, the ends of the cloth may turn again over the top of it; when this is done, it should be taken to the press, and there remain for the space of two hours, when it should be turned, and have a clean cloth put under it, and turned over as before; it must then be pressed again, and remain in the press six or eight hours, when it should again be turned, and
rubbed

rubbed on each side with salt, after which it must be pressed again for the space of twelve or fourteen hours more; when, if any of the edges project, they should be pared off; it may then be put on a dry board, where it should be regularly turned every day.

It is a good way to have three or four holes bored round the lower part of the vat, that the whey may drain so perfectly from the cheese as that not the least particle of it may remain.

The prevailing opinion, of the people of Gloucestershire and the neighbouring counties is, that the cheeses will spoil if they are not scraped and washed when they are found to be mouldy; but I know this to be erroneous, and that suffering the mould to remain, mellows them, provided they are turned every day; or if they will have the mould off, it should be removed with a clean dry flannel, as the washing them is only a means of making the mould (which is a species of fungus rooted in the coat) grow again immediately.

Some people scald the curd, but this is a bad and mercenary practice; it robs the cheese of its fatness, and can only be done with a view to raise a greater quantity of whey butter, or to bring the cheeses forward for sale, by making them appear older than they really are.

As most people like to purchase high-coloured cheese, it may be right to mix a little *annatto* with the milk before it is turned; no cheese will look yellow without it; and though it does not in the least add to the goodness, it is perfectly innocent in its nature and effects.

It is not in the power of any person to make good cheese with bad rennet; therefore the following receipt should be attended to.

First; That the *vell maw*, *rennet-bag*, (or by whatever other name it is called) be perfectly sweet, for if it be the least tainted, the cheese will never be good. When this is fit for use, three pints or two quarts of soft water (clean and sweet) should be mixed with salt, wherein should be put sweet-briar, rose leaves and flowers, cinnamon, mace, cloves, and, in short, almost every sort of spice and aromatic that can be procured, and if these are put into two quarts of water, they must boil gently till the liquor is reduced to three pints, and care should be taken that this liquor is not smoaked; it should be strained clean from the spices, &c. and when found to be not warmer than milk from the cow, it should be poured upon the vell or maw; a lemon may then be sliced into it; when it may remain a day or two, after which it should be strained again and put

put in a bottle, where, if well corked, it will keep good for twelve months or more; it will smell like a perfume, and a small quantity of it will turn the milk, and give the cheese a pleasing flavour; after this, if the *vell* be salted and dried for a week or two near the fire, it will do for the purpose again almost as well as before.

Chedder cheese is held in high esteem; but I am well informed its goodness is chiefly owing to the land whereon the cows feed, as the method of making it is the same as is pursued throughout Somersetshire, and the adjoining counties; I mean not to exclude the north parts of Wiltshire, where the land has a surprising effect on both butter and cheese.

Cheshire cheese is much admired; and here I must observe, that no people take less pains with the rennet than the Cheshire farmers; but their cheeses are so large as often to exceed one hundred pounds weight each; to this (and the age they are kept, the richness of the land, and their keeping such a number of cows, as to make such a cheese without adding a second meal's milk) their excellence may be attributed; indeed they salt the curd, (which may make a difference) and keep the cheeses in a damp place after they are made, and are very careful to turn them daily.

But

But of all the cheese this kingdom produces, none is more highly esteemed than the *Stilton*, which is called the Parmesan of England, and (except faulty) is never sold for less than one shilling or fourteen-pence per pound.

The *Stilton* cheeses are usually made in square vats, and weigh from six to twelve pounds each cheese. Immediately after they are made, it is right to put them into square boxes made exactly to fit them, they being so extremely rich, that except this precaution be taken they are apt to bulge out, and break asunder: they should be continually and daily turned in these boxes, and must be kept two years before they are properly mellowed for sale.—Some make them in a net, somewhat like a cabbage net, so that they appear when made not unlike an acorn; but these are never so good as the other, having a thicker coat, and wanting all that rich flavour and mellowness which make them so pleasing.

I must not omit to mention, that no people are more cleanly in their dairies than those of *Stilton* and its neighbourhood; and must also observe, that the making of these cheeses is not confined to themselves alone, as many others in Huntingdonshire (not forgetting Rutland and Northampton-shires) make

make a similar sort, sell them for the same price, and give all of them the name of *Stilton* cheeses.

Though these farmers are remarked for cleanliness, they take very little pains with the *rennet*, as they in general only cut pieces from the *vell* or *maw*, which they put into the milk, and move gently about with the hand, by which means it breaks or turns it so, that they easily obtain the curd; but I am well assured, that if the method above described for making *rennet* were put in practice, they would make their cheese still better; at least they would not have so many faulty and unsound cheeses; for notwithstanding their cheeses bear such a name and price, they often find them so bad as not to be saleable; and I attribute this to their being so careless about the *rennet*.

I am persuaded as good cheese might be made in other counties, if people would adhere to the *Stilton* plan, which is this—They make a cheese every morning, and to this meal of new milk they add the cream taken from that which is milked the night before; this, and the age of their cheeses, I am almost confident, are the only reasons why they are preferred to others; for, from the nicest observation, I could never perceive that their land was in any respect superior to that of other counties.

Excellent

Excellent cream cheefes are made in Lincolnshire, by adding the cream of one meal's milk to milk which comes immediately from the cow; these are pressed gently two or three times, turned for a few days, and are then disposed of at the rate of one shilling per pound, to be eaten while new with radishes, fallad, &c.

Many people give skimm'd milk to pigs, but the whey will do equally as well after cheefes are made from this milk; such cheefes will always sell for at least two-pence per pound, which will amount to a large sum annually where they make much butter. The peasants, and many of the farmers, in the north of England, never eat any better cheese; and though they appear harder, experience hath proved them to be much easier of digestion than any new milk cheefes. A good market may always be found for the sale of them at Bristol.

As I have taken much pains, from actual practice, to find out the defects of others in making butter and cheese; so through my advice several have attained a perfection in this art; and I shall think myself unworthy your patronage, if all do not excel who will strictly adhere to the methods laid down in the foregoing pages. I am,

Your obedient servant,

Stoney-Littleton, Somerset, JOS. HAZARD.

Oct. 7, 1785.

ARTICLE XXII.

*Of the Duration of the Wood of different Kinds of Trees,
in their different Application, when exposed to the
Weather.*

[By Sir THOMAS BEEVOR, bart.]

GENTLEMEN,

Sept. 11, 1784.

AS the raising plantations of trees is not only an object of great national concern, but falls likewise within the compass of the Society's plan to encourage; and as the value and duration of the several kinds of them, in their different applications and uses, is a subject of much utility as well as curiosity, I shall give you a short account of an experiment made on some of them by a worthy friend of mine, a nobleman of this county, who is as much distinguished by his thirst after and possession of classical and philosophical knowledge, as he is honoured and beloved for his extensive philanthropy.

Wishing to know the duration of some of the trees with which his noble plantations abound, he ordered, in the year 1774, three posts, forming two sides of a quadrangle, to be fixed in the earth upon a rising ground in his park. Into these posts were morticed the planks of the following trees, of which six faced south and north, and six of them
east

east and west. In the first were put a plant of cedar, larch, spruce fir, silver fir, Scotch fir, and pineaster. In the second, a plank of Spanish chefnut, abele, beech, walnut, sycamore, and birch.

These after being exposed to the injuries of the weather from the year 1774 until last March, the time at which I viewed them, I then found in the following state and condition:—

The Cedar was perfectly found.	Pineaster, quite rotten.
Larch, the heart sound, but the sap quite decayed.	Chefnut perfectly found.
Spruce fir, found.	Abele, found.
Silver fir, in decay.	Beech, found.
Scotch fir, much decayed.	Walnut, in decay.
	Sycamore much decayed.
	Birch, quite rotten.

These planks were cut out an inch and a half thick, from trees of thirty years growth.

The above-mentioned appearances in some instances much disappointed my expectation.—However, thus I found them; and as every experiment of this kind may be so easily conducted by any body, I hope it will be again and again made, upon an enlarged plan, with additional trees of different ages, abroad, and under cover; whereby the most profitable application of them may be fully ascertained. I am, your obedient servant,

Hethel-Hall, Norfolk.

THO. BEEVOR.

P. S. You will find by the date of my letter, that I have kept it some time since it was written. The delay, however, has enabled me to set right one fact contained in it. I was last week, at Houghton, and wishing to see that my relation was true in every particular, on questioning the steward, I found to my mortification that in some of the woods above-mentioned there was a difference of ten or fifteen years in the growth of the trees from which the planks were cut. Though for the sake of truth I was glad to make this discovery, yet I am sorry to find that it lessens in some degree the value of the experiment.

[N. B. We hope the preceding letter from Sir THO. BEYER will excite other gentlemen to make similar experiments, the event of which may prove of public utility.]

ARTICLE XXIII.

A Philosophical Enquiry concerning the Principles of Vegetation, with a view to ascertain the most certain means of promoting its Improvement and Extension.

[By Mr. JOSEPH WIMPEY, of North-Bockhampton.]

GENTLEMEN,

THE subject of this enquiry has been an object of pursuit in every age, and of every civilized country in the world; not uniformly, and uninterruptedly,

interruptedly, indeed, but in proportion to the peace and tranquility of respective states and times. Rome, once the mistress of the world, did not shine more in the arts of government and civil polity, than in the cultivation of her lands; and we find the same patriotic statesmen, who rendered themselves immortal by their unremitting efforts to support and maintain liberty, were not less eminent for their patriotic ardour to promote and encourage the beneficial culture of its soil.

Intestine commotions and civil broils are ever unfriendly to science and the arts, but to none more so than to agriculture; for when the occupier's tenure is rendered precarious by civil discord, he has little inclination and less encouragement to attempt improvement; and still less to plough and sow, it being uncertain who may reap, indeed whether there will be any thing to reap; it having too commonly happened, that whole countries have been ravaged and become desolate by the desperate frenzy of hostile and bloody contenders, who too frequently are deaf and blind to the remonstrances of humanity.

It is certainly clear, from the average prices of corn and provisions of all kinds for twenty years past, that there is not too much land in cultivation.

Prices

Prices have been considerably above what has been deemed, and that justly too, the medium standard. As a manufacturing and commercial country, it is properly the duty of the legislature to provide, as far as consistently may be with the liberty of the subject, that the price of provisions may be kept as nearly as possible to their medium value. This is conceived to be very practicable, even so as to be a convenience to the grower as well as the consumer.

Some writers of great abilities* have supposed, that the advance of commodities in price is rather apparent and nominal, than real. Things are not so much, if at all, advanced in price, say they, as is imagined; the precious metals are exceedingly increased in quantity, and proportionably fallen in value. Possibly there may be some truth in this observation, if we go back some hundred years, and if taken upon a scale that comprehends all Europe; but for the term of twenty or fifty, or even from the time Mr. LOCKE wrote to the present hour, there is little difference in the value of silver or gold; an ounce of either being of much the same value now as then. The frequent and sudden changes that take place in the price of corn and other commodities, which sometimes are at double the price one year they were the foregoing, must

* MR. LOCKE, BARON MONTESQUIEU, &c.

be owing to some other cause than that above-mentioned, which operates slowly, if at all, and is not perceivable in less time than a century.

If the quantity of corn and provisions at market always bore the same proportion to the demand there is for them, the price would be always invariably and unchangeably the same. The variation of prices therefore is governed by the variation of the said proportion. If the demand be greater, and the quantity the same, or the demand the same, and the quantity less, the price must necessarily advance; and *vice versa*, if the quantity should increase, and the demand continue the same, the price must as necessarily fall; and it is not in the power of man to make it otherwise. But though this immutable relation is beyond our power to alter, we can by art and industry increase the quantity, and thereby lower the price; cheapness being the infallible consequence of plenty, which is the direct object and effect of an improving cultivation. This is a matter of great consequence to the poor labourer, the manufacturer, and merchant; and no disadvantage to the grower; because what he would lose by the fall of price, he would gain with interest by an increase of quantity.*

* This is not always the case. Of two profits *nominally equal*, that is to be preferred which is obtained with the *least expence of labour*:—That which arises from an *increase of quantity*, is clogged with the *greatest*, and much more care and trouble.

It is not easy to conceive how many and how great the improvements are, which have been made in this most important of all arts, in the course of the present century. A patriotic spirit of uncommon ardour hath gone forth; and our nobility and gentry, like the Senators of Rome, have set, as it were, their hands to the plough, and excited their tenants and neighbours to practices of which they had no idea before. Yea, they have done more; they have instituted societies, and made them the receptacles and distributors of useful knowledge; they have raised subscriptions, and added marks of honour, and pecuniary advantages, to the rewards which naturally result from the attention and industry of the ingenious artist. Surely the greatest respect is due to the members of all those institutions, whose motives are—public good and universal usefulness.

But it must be allowed, that, although much has been done, there still remains much more to do. Experimenters have not always (perhaps but seldom) entered into the views, and ably seconded the intentions of those valuable institutions. Animated with the hope of obtaining the premiums held out, by dint of extraordinary exertions, expensive manures, and a concurrence of fortunate circumstances, more the effect of chance than of design, they often

have been the successful adventurers, though at the same time entirely ignorant to what causes they owed their success. We too often indeed ascribe effects to causes which are no way connected with them. The practice of such men is more like the nostrums of quacks, than the recipes of a regular physician. The medicine may be good, but being ignorant of principles, they know not how to accommodate it as different circumstances may require.

How vegetation may be carried to the greatest degree of perfection, 'by means easily practicable, and at the same time the most advantageous to the husbandman, is one' of the most important enquiries that the human understanding can be employed in the pursuit of. Some ingenious men, however, have made the following the previous question, "What is that substance, matter, or thing, which is the true and only proper food of plants; which enters into the vessels appointed by nature to receive it, is assimilated by, and becomes constituent parts of them, augmenting their magnitude, extension, and weight, from an almost imperceptible atom to the weight of many tons, and to a body of inconceivable dimensions?"

This question seems much more curious than useful, and is perhaps of very little consequence to
the

the husbandman. The philosopher may amuse himself by enquiring after first principles, and the elementary parts of bodies, but the farmer should never be diverted from a profitable practice, until one more so is recommended by the success of repeated experiments.

Various are the opinions of the learned concerning this matter. Some suppose the food of plants to be water; some earth; others air, nitrous salts, oil, &c. &c. perhaps all of them wide enough of the mark. It must be confessed, we know nothing of the essence of things. We are not endued with faculties equal to the curious research. Things are known to us by their properties only. But what are their properties by which they are known to us, but certain powers to affect us in a particular manner, and to impress different sensations and perceptions on our bodily organs? These different perceptions, indeed, enable us to distinguish, accurately enough, one thing from another; but we are totally ignorant of the nature of those powers, and equally so of the essence or substratum in which they inhere, and by which they are supported.

The great system of the universe is governed by general laws, which, so far as our knowledge extends, obtain universally. Gravitation, attraction, repulsion, cohesion, and perhaps many other principles,

ciples, affect every portion of matter that comes within our knowledge; but what supports those powers, in what their energy consists, or from whence they are derived, we are by no means able to apprehend or conceive. Vegetation also obtains universally on this globe. Wherever there is earth, vegetation takes place; therefore the principle (or principles) of vegetation, whatsoever it be, or in whatsoever it consists, must be universal; and all that is necessary for the husbandman to do, is to prepare his ground effectually, put in his seed or plants at the proper season, and vegetation will most assuredly follow. Indeed, so prolifick is nature as to clothe the face of the globe with herbs and plants in every region, without the intervention or assistance of man. The fund or magazine, then, which furnishes the pabulum or food of plants, is established and supplied by the œconomy of nature, seeing it obtains at all times and every where, unassisted by art. But how and in what manner nature is to be assisted, how and by what means vegetation is to be promoted, and carried to its utmost and most beneficial degree of perfection, is the grand *desideratum*, the great and important object, of our enquiry.

Experiments or observations made on occurrences which happen in the course of things, are the
ground-work

ground-work of all certainty in this matter. Theories not built upon and supported by experiments are matters of mere amusement, and have no existence but in the imagination. Unfortunately, experiments have been published by the thousand, which bear the clearest internal evidence of their never having been made but upon paper. Such writers should be regarded as the sharks of society, who would sacrifice truth, mislead mankind, and impose upon the publick, to pocket a little money. But to proceed with our enquiry.

The principles of vegetation, and the means by which it may be promoted in the most successful and beneficial manner, may be fitly divided into three general heads, and distinguished by the terms *mechanical*, *chemical*, and *nutritive*. The *mechanical* includes every operation which tends to break, divide, and pulverize the soil; whether it be by ploughing and harrowing, digging and hoeing, or by any other means whatever; that being the most eligible which most effectually performs the operation at the least expence.

Pulverizing the soil may be truly considered as the first step towards an improving vegetation; not as *producing* the food or nourishment of plants, but of putting the soil into a fit condition for *receiving* it,

it, from whatever source it may be derived, and giving easy access to the roots and fibres which extend themselves every way in quest of the same.

Chemical principles produce much the same effects, but in a way we cannot so easily, nor so perfectly, comprehend. The mechanical powers are subservient to our wills, and we can continue the use of them until the desired end is obtained; but the effects of chemical operations are not so certain in this business, as a certain concurrence of circumstances, not always in our power to procure, is necessary to produce the hoped-for success. Much depends upon the temperature of the seasons, the state of the air, and many other things not in the power of man to foresee or to govern. Fermentation seems to be the principal agent in promoting vegetation by chemical powers. This divides, attenuates, and subtilizes, by means of an internal motion of the parts, which we cannot clearly conceive. Probably it is on this principle that marl, chalk, shells, and every kind of calcareous earth, are fertilizers of land. Not by any matter or substance inherent in them, as constituent parts of the same; but as absorbent bodies, which attract much more powerfully the principles of vegetation than earth alone could do.

We come next to enquire concerning nutritive principles. And here we have a field to range in as capacious at least as the earth we inhabit, together with its atmosphere; perhaps much more, even not less than the solar system, as that immense body of fire, which is the centre thereof, gives life and energy to the whole creation; and annually revives, reanimates, and bestows as it were rejuvenescency on the whole animal and vegetable world.

But before we proceed on this enquiry, it may be proper to make a few observations, the truth of which is self-evident, and consonant to the common sense of mankind. By common sense, the writer does not mean common *opinion*; for nothing is more vague and liable to error than that; but those ideas which are the same in all men, as proceeding from identical or similar sensations and perceptions involuntarily impressed upon them. This is the true and only defensible meaning of the term common sense, though it is frequently made to stand for, and express, principles which are supposed to be innate in the mind, but in fact have nothing common or identical in them, but are as infinitely diversified in different men as are their features.

There seems to be a natural relation, connexion, and dependence, between the animal and vegetable

ble kingdoms. No part of the terraqueous globe that we know of, that is occupied by living creatures of any kind, but is replete with vegetables proper for their sustenance and support; and it is equally certain, that wherever vegetables grow and flourish, it is stocked with animals in proportion thereto.

It is sufficiently obvious, that the animal kingdom is maintained and supported by the vegetable; for though carnivorous animals eat little or no vegetable food, yet they live upon those which are entirely supported by it; for they never eat each other, unless in cases of famine or great distress. It is very possible the vegetable kingdom may no less depend upon the animal for its sustenance and support, than the animal doth upon it; and if the writer is not much mistaken, pretty clear and strong evidence may be had, that this is really the case; so that they reciprocally subsist on and are supported by each other.

It is not many years since that a surprising discovery was made by that very celebrated investigator of nature Dr. PRIESTLEY, who clearly proved by experiment, that common air, when become feculent and putrid by animal respiration and perspiration, so as to be unfit for the common purposes
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of life, is readily purified and make wholesome by the vegetable kingdom, which imbibes and absorbs those putrid steams that are so deadly noxious to animal life. But what is most surprising, instead of growing sickly in so impure an air as he expected, he found the plants were invigorated and their growth promoted thereby; so that they were more fresh, green, and healthy, than those which grew in common wholesome respirable air.*

This wonderful œconomy of nature loudly proclaims the wisdom and goodness of Providence; for how great soever might be the fund of common air necessary to the purposes of life, such is its continual waste and consumption, that the whole stock must soon have been exhausted, and animal life become extinct, if no provision had been made to purify and render wholesome the original stock, as daily use might require.

But not to insist on a particular instance which may be thought too curious to establish a general principle upon, let us enquire how far this doctrine may be supported by the concurring testimony of all mankind, in which there is not a possibility

* A very full and pleasing account of this wonderful discovery may be found in a very elegant discourse of Sir JOHN PRINGLE's, read before the Royal Society at one of their anniversary meetings, which met with general approbation; and some marks of favour were bestowed upon the Doctor, in reward of his ingenuity.

of deception; for if those facts which are agreeable to and supported by the common sense of mankind cannot be depended upon for certain infallible truths, then there is no such thing as certainty attainable by human nature. Is it possible to doubt, if that glorious luminary the sun, which dispenses heat, and light, and life, to this lower world, hath any real existence, and is the cause of those sensations? Surely it is not; and yet in what does this certainty consist, but the common sense of mankind? I see, feel, perceive, and am affected in a particular manner by the appearance of this fountain of life; all mankind are imprest with identical or similar sensations, perceptions, and affections; therefore no man doubts, or can possibly doubt of, the certainty and reality of the sun's existence.

All truths which are derived from common sense, are equally certain with the above; for if it were possible that all men could be deceived in any of those sensations, perceptions, and affections, which are common to all men; that is, if they could see, feel, and be affected in any way or manner they could not see, feel, and be affected, then truth and certainty to the human mind would be an impossible thing; there being no criteria by which truth might be distinguished from falsehood, nor man indued with faculties to perceive and mark the difference of things.

Those

Those things then which are felt, perceived, and produce the same sensations and affections in all men, and every where, may be depended upon as truths infallibly certain, beyond a possibility of deception. Not so experiments made by the most careful and the most candid, till they have been repeated again and again; and the first trials confirmed and duly authenticated by subsequent ones. Much more is to be feared from the cunning, the artifice, the prepossession, the prejudice, the vanity, and the interest, of designing men, who too frequently have been found to warp and bend their accounts, to promote their interested views.

It is in the observation of every man, from the illiterate occupier of a cottage to the first gardener of a prince, that all kinds of animal substances, when thoroughly digested and corrupted, are the strongest and most powerful promoters of vegetation. The hair, the skin, the horns and hoofs, the urine and excrements, the flesh, blood, sinews, and even the bones, are all richly replete with matter which supports and invigorates vegetation universally. It is therefore undeniably certain, that animal substances contain those principles which are the real and genuine food of plants. It is absurd therefore to suppose their food is earth, or water, or air, fire, or heat, or any one simple element or thing

thing whatever. It seems clearly evident, that it is a combination of principles derived from animal substances by the chemistry of nature. When animal substance has been thoroughly putrified, almost the whole becomes volatile, and is so far attenuated, subtilized, and refined, as to be rendered capable of entering the roots and fibres of the minutest plants.

It seems then, that as the animal kingdom is entirely supported by the vegetable, so is the vegetable by the animal, and each is reciprocally the support of, and is supported by the other. The matter of each is essentially the same, each is indued with the principles of life and augmentation, though appearing under very different forms; each mutually transmutable into the other by the mere unassisted operations of nature.

Hence it seems to appear, that the wisdom and goodness of Providence have established the means of supporting and upholding the present system of the universe, till time shall be no more, by constant, uniform, uninterrupted powers or laws, which act unceasingly for the mutual conservation of the whole. Every atom of matter, whether animal or vegetable, seems to teem with life, yet contains within itself the seeds of corruption and decay.

In

In that state it enters into a new system of organization, and becomes the principle of regeneration and rejuvenescence, which annually returns at the appointed seasons, when all appears charming, sprightly, and gay.

To this theory it may be objected, that vegetation may be successfully promoted by vegetable manures, without the least assistance from animal substance of any kind. Every one knows that it is common to manure the ground by ploughing in green vegetables, such as buck or French wheat, clover, vetches, &c. which often succeed well without any other help whatever. This objection falls short of its object; it only proves, that profitable crops may be obtained without the cultivator's using animal substances under that form; but the theory supposes, that every vegetable is replete with principles derived from animal substances, and only differs from them in being more subtilized and refined.

It is equally certain, that vegetation may be powerfully promoted, without laying on or providing any manure at all. The new or horse-hoeing husbandry depends entirely upon reducing and pulverizing the soil. It cannot be reasonably supposed, however, that the spade and hoe, or plough
and

and harrow, convey any fertilizing principles. These operations, which are found to render our lands so surprisngly fertile when judiciously performed, only prepare the soil for the easy entrance of those fertilizing principles with which the atmosphere is abundantly replete. The atmosphere is the grand magazine, the great receptacle of putrid exhalations, which incessantly fly off from all animal substances, the living as well as dead; and by their specifick levity mount up into the air, from whence, being condensed, they return in dews, rain, snow, &c. and impregnate the soil as deep as it hath been duly pulverized.

It seems very evident then, that whether the husbandman manure his fields from the dung-heap, or by ploughing in green vegetables, or by duly exposing it to the unceasing influence of the atmosphere; the principles of vegetation, which he bestows in either case, are essentially and substantially the same. They all equally originate from putrid animal substances. That from the dung-heap is indeed by far the strongest, it having not gone through its last stage of digestion and putrefaction; in this gross and impure state, it sometimes poisons and kills, and thereby defeats its intended purpose. It in general, however, when discreetly used, gives great luxuriance and an enlarged

larged size to the stalks and blades; but luxuriance is not fruitfulness; indeed, they are seldom if ever compatible. This holds good in all kinds of grain as well as fruits. Manure imperfectly digested, or used in too great abundance, often defeats the views and hopes of the planter; he may reap a great burthen of straw and very little corn. The same thing may happen from green vegetable manure, unless it be ploughed in time enough to undergo a thorough fermentation, and at the last ploughing be intimately blended with the soil. But of this there is no danger in the last-mentioned method of cultivation; for the principles of vegetation derived from the atmosphere, by thoroughly pulverizing the soil, are so perfectly digested, subtilized, and refined from the impurities of the former, that unhealthiness or a surfeit is not to be apprehended, especially as it is not given all at once like the former, but administered from time to time as the skilful husbandman may see necessary.

I should now proceed, according to my proposal, to consider of the easiest and most effectual means of promoting vegetation, in support of, and consistent with, the above principles; but as I apprehend that would run this paper to an inconvenient length, I must postpone it for some future opportunity.

I am, &c.

North-Bockhampton,

JOS. WIMPEY.

Hants, Dec. 1785.

ARTICLE XXIV.

A Practical Enquiry concerning the most certain and effectual means of promoting Vegetation.

[By the Same.]

GENTLEMEN,

IN a former paper I attempted to shew that there is a natural relation or connexion between the animal and vegetable kingdoms. That as the animal kingdom lives on, and is wholly subsisted by, the vegetable; so is the vegetable no less maintained and supported by the animal. Each by turns being mutually the support of, and supported by, the other.

If this theory be just, animal substance, from whatever subject it is derived, or under whatever form it may appear, when it is perfectly digested and putrified, subtilized and become volatile, is the true, genuine, and sole aliment of plants. The dunghill, which consists chiefly of animal excrements, contains the greatest quantity of nutritive principles of any substance whatever of equal dimensions, the constituent parts of animals only excepted. The dunghill, therefore, is the greatest and most powerful fertilizer of land; and could the farmer acquire as much of it upon moderate terms

terms as he chose, he might soon make his land as fertile as the climate would admit, or he could desire. But in most situations, the quantity to be got, as every one knows, bears a very small proportion, indeed, to the quantity wanted.

As a substitute and succedaneum to the dung-heap, ploughing in green vegetables has been adopted with success. This practice is a kind of improved fallowing; for though the land be cropped, its produce at a proper season is ploughed in, and no present profit is derived from it. The land therefore may be properly said to be under fallow, until by future culture it is in fit condition to receive the seed of a future crop.

But the more general practice is, when the land has been exhausted by having been too frequently cropped, and is become foul and full of weeds, to give it a year's fallow; or sometimes two winters and a summer's fallow, which is often necessary to eradicate the weeds, thoroughly pulverize the soil, and render it sufficiently fertile to bear a crop of wheat. But when a man enters upon a farm that has been racked out by the former tenant, and the whole of it left in the sad condition above represented, to give it a year's fallow, without receiving any beneficial return, would to most

prove a severe trial both to their patience and their pockets.

Mr. TULL, to whose memory the most grateful tribute of respect is due, has in a great variety of instances shewn to what an amazing degree of fertility even very poor land may be brought by repeated and frequent breaking, dividing, and pulverizing the soil. The truth and propriety of his principles are generally allowed, and indeed cannot be well controverted, how much soever the mode he adopted, and his method of applying them, may be decried by some, and by the peculiar circumstances of the land of others rendered impracticable. The soil of his estate was in general light and fragile, and in all respects peculiarly suitable to his mode of practice. All land, whatever may be its temperature, may be fertilized and improved by frequent ploughing and harrowing, if they are well timed; but all land is not equally suitable to the drill and horse-hoeing culture; and some, though perhaps comparatively little, not at all so. Hilly countries, land that is rocky or abounding with large loose stones, or that consists of a strong, moist, adhesive clay, is not in general suitable to the drill culture; but the land that is not suitable, I apprehend, bears no great proportion to that which is. The intelligent husbandman, who
is

is convinced of the truth of the principles, will readily vary the application of them as circumstances may require.

When land is exhausted, quite out of tilth, and overrun with the strongest and most noxious weeds, it is absolutely necessary to eradicate them, to clean and pulverize the soil; otherwise the seed, whatever it may be, might as well be thrown on the highway, as sown in land in that condition. It is a question of great importance, how and by what means land may be fertilized and its vigour restored, the weeds displaced and destroyed, consistently with the beneficial culture of a profitable crop growing on the same field at the same time. It will readily occur to the reader, that this is not possible to be done in any mode of culture but that of planting in drills, and pulverizing the soil by ploughing and horse-hoeing the intervals during the growth of the crop through the whole summer. Mr. TULL rightly advised well-timed ploughing and harrowing, till the land was thoroughly pulverized and well cleaned of weeds; for the grain and plants, which were chiefly the subjects of his culture, would by no means admit of being sown in an exhausted soil overrun with weeds with the least prospect of a crop, though it may be ever so certain that the growth of the several articles he cultivated

was promoted in the most beneficial manner by the due use of the horse-hoc, or hoe-plough.

Wheat, turnips, lucern, and sainfoin, and indeed every other kind of plant, when well fixed and established in the ground, may be greatly promoted in their growth by the discreet use of the hoc-plough; but previous to the use of this instrument, they must have arrived to a certain stage of their growth, otherwise the hoe-plough would entirely displace and totally destroy them. It is therefore absolutely necessary, that the land in which these articles are to be sowed, should at least be moderately fertile, and very clean from weeds, which can be effected only by being thoroughly pulverized previous to its being sowed.

Turnips, lucern, sainfoin, clover, and many others, are very precarious articles, even when skill has been used, and great pains taken, to insure a crop. Land is sometimes sowed with turnips three or four times to no purpose, and many other crops frequently miscarry through circumstances which human sagacity cannot foresee, nor human prudence remedy. The failure of these articles is generally imputed to the ravages of the fly, and true it is that they prey upon them by millions; but if my observations are just, the evil does not
begin

begin there. It is common for the seeds of the above-mentioned plants to come up finely and look healthy; but heat and drought coming on, the juices of the young plants thicken and stagnate, circulation is stopped, they wither, and are suddenly destroyed by the fly. It is very common to see whole fields in this condition, excepting under the shadow of the hedges, which in some measure retain the dews of the nights, and screen the young plants from the scorching sun-beams. We frequently see very flourishing plants under hedges, when the crop of ~~the~~ the rest of the field is entirely destroyed; and I am clearly of opinion, the same disappointment would happen in every poor soil, if the appearance of the plants were immediately followed by a few dry hot scorching days, though there should not be a fly to prey upon them. The best means to guard against such a disappointment, when any of these articles are to stand for a crop in the place they are sowed, is thoroughly to cleanse the ground, duly break, divide, and pulverize the soil, and dress it with a well-prepared artificial compost, which, if the season should not prove singularly unfavourable, would most probably give a degree of vigour to the young plants, which would totally defeat the ravages of the fly; and if the land were to be sown in drills, a very moderate quantity of the compost being re-

gularly spread in the path of the drill previous to the sowing the seed, would be sufficient for the purpose.

A plentiful crop of turnips, or of artificial grasses, is a matter of very great importance to a farmer who has a large stock of cattle to feed; it therefore merits his most serious attention, how and by what means he may render the growth of those articles more constant and certain, which in the common course of practice are very precarious, and not to be depended upon. For this purpose, I would advise him to keep twenty, thirty, or fifty loads (the quantity proportioned to the extent of his farm) of a good compost always by him, ready prepared, to be used as occasion may require. This may be done at a very moderate expence in the following manner:—

Of a field that is conveniently situated, plough and harrow the headlands, till the soil be well divided and in fine tilth; then take a cart-load, or forty bushels, of good strong well-burnt lime, fresh from the kiln, and place it in little heaps, about a bushel in each, along the middle of the said headlands, about four feet distant from each other. This done, with a shovel cover the heaps of lime with four or five times its quantity of pulverized earth,
and

and pat it down close with the back of a shovel, so as to exclude both the rain and the air. In a few days, the moisture of the earth will have dissolved the lime, and reduced it to a powder. A workman, however, should from time to time inspect the heaps, for they will soon begin to heave and swell, and have large fissures in them, which must be carefully filled up by having more earth thrown upon them, and patted down close. This must be repeated as often as occasion may require; for rain would cause the lime to run into a kind of irreducible calx, and the air would rob it of its fertilizing quality, as it is well known it does of its medicinal virtue. When the lime is perfectly reduced to a powder, the earth and lime must be chopped down with a spade, and intimately blended and incorporated together. This is most conveniently done in form of a long bank or ridge, in the middle of which a large furrow or opening must be made sufficient to receive five cart-loads (forty bushels each) of good fat spit dung; then the earth and lime must be thrown over the dung so as to cover the whole. In this manner it must lie some months, or till the dung is in a state of dissolution, which it will soon be by means of the lime. When arrived to this state, it must again be turned over, and incorporated as intimately as possible, and then formed into a heap to be kept for use. Earth,
lime,

lime, and dung, thus managed, constitute an unctuous saponaceous mass of great fertility, and perhaps this is the most beneficial method of manuring with lime of any in use; for at the same time that it promotes the growth of the crop, it meliorates and improves the soil; whereas, in the common way of using it, it is thought by most, that though it may invigorate for a crop or two, yet it infallibly impoverishes the land. It is true, however, that there is no article in the whole art of husbandry, concerning which even practical men are more divided, than about lime. Some declare they have expended large sums of money in the use of it, without deriving the least benefit from it; with others, it is the *sine qua non* of vegetation; without it, they think they had better not sow their land; indeed, the practice so far prevails in some counties, that the tenant is tied down by an article in his lease to lay on a certain quantity every third or fourth crop, from sixty to one hundred and sixty bushels an acre. It is not difficult to account for this seeming irreconcilable difference of opinions, but it would require more room and time than can be allowed at present. I will only add, that a compost formed as above, would make an excellent top-dressing to be used in the spring, and if not wanted for the purposes first mentioned, would be very useful for the last. But from this long digression, let us return to our subject.

We

We will suppose the land we have to cultivate is in its nature rather poor and unfertile, and rendered more so by being too frequently cropped, and its culture neglected, and consequently overrun with the worst kind of weeds; the question is, what mode of culture will bring such land into proper tilth, and produce a profitable crop at the same time with the least expence? To answer this purpose, I have already observed, the crop must be planted in rows with intervals sufficiently wide to admit the free use of the hoe-plough whilst the crop is growing, as often as the growth of the weeds requires it. This will be three, or perhaps four times, in such foul land, during the course of the summer. For this purpose I know only of three or four articles which will by any means answer. These are, the different species of cabbage plants, beans, potatoes, and perhaps pease. I have tried carrots, parsnips, turnips, turnip-rooted cabbage, lucern, sainfoin, and every sort of grain, but without the least success; for in spite of every effort, the weeds baffled all attempts, and destroyed the young plants that arose from seed, before the hoe-plough could be introduced. Cabbages, beans, and potatoes, were all the articles that afforded a profitable return. The field in which I made my experiments is seven acres, and was exactly in the poor condition above described. The method I pursued

purfued to bring this field into proper tilth is as follows, and I believe a better cannot be devised.

As foon as harveft is well over, give the field a clean ploughing in the ufual manner. Dragging and harrowing at this feafon can feldom be of any ufe; the earth is generally too adhesive to part with the roots which bind it together. As foon as the ploughing is finifhed, give it another directly acrofs the firft; but this muft be performed in a manner very different from the former. Begin at the farther end of the field, and with one bout of the plough, make the furrows as deep, and the ridge as narrow and as high as may be. Upon the outward edge of the outward furrow enter the ploughshare, and with another bout of the plough form a fecond ridge, and fo proceed through the whole field. It will then lie in deep open furrows, and high narrow ridges, and confequently expofed to the influences of the atmofphere in the largeft extent of fuperficies that is poffible. If the winter fhould prove ever fo wet, the ridges will be kept dry by the open furrows; but if it fhould prove fevere, the froft will penetrate quite through the ridges, and impregnate almoft the whole of the foil they contain. If in the latter end of February, or any part of March, the weather fhould be dry and open, the ridges may be drawn down by the drags,
and

and the field levelled to prepare it for planting. The advantage of this method must needs be evident to every practical man, for nothing in art or nature renders even the most adhesive soil so short and friable as exposing it through the winter to the frost.

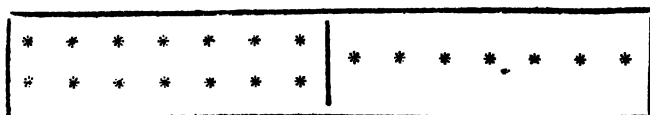
This being the state of the field, we proceed now to prepare it for planting. On the further side of the field, about a yard distant from the hedge, draw a furrow with the plough from one end of the field to the other, and return the plough again in the same furrow. This will make it wide, deep, and clean. Then enter the ploughshare about nine inches distant from the edge of the furrow, and with one bout of the plough, throw the earth on each side into the middle of the furrow. A second bout of the plough, performed in the same manner, will form a high ridge about three feet wide. It is evident, a ridge thus formed will, under the crown or most elevated part of it, have *twice* the depth of pulverized earth that can be had in common ploughing. The whole field is to be formed into ridges in the same manner as the first. In land that is tolerably clean, and in pretty good tilth, the intervals between the ranks of plants on the tops of these ridges will be wide enough for the hoe-plough to work, and keep it so. But land
in

in the sad condition above described, might be more conveniently and effectually cleansed and improved by forming the ridges by the bouts of the plough, which would make them about four feet and a half wide, and consequently there would be intervals of near four feet for the hoe-plough to work in. If the season should prove favourable, and the intervals ploughed three times in the course of the summer, the foil would be reduced almost to a powder.

Let us suppose then the field to be formed into *three-bout ridges* as above, and the time for planting beans arrived; with a common plough I make a clean furrow on the crown of each ridge, about a foot wide, and four inches deep, going down one ridge and up the next, and so on through the whole field. The beans are then dropped in the furrows, either in two rows, seven or eight inches asunder, or in a single row in the middle of the furrow, as represented below, No. I. No. II.† If the seed be good, the distance may be three inches bean from bean; if otherwise, they should be

† No. I.

No. II.



planted

planted cloſer. This may be performed very conveniently by a ſmall hand-barrel drill, with which a boy might plant fix acres a day; or for want of ſuch an inſtrument, the beans might be dropped by women, boys, and girls, very expeditiouſly; as the furrow would be an infallible guide, which they could not miſtake either in the rows or depth, though they might ſomewhat in the diſtance of the beans; but as the furrows would remain open for the preſent, every error would be liable to detection.

The beans being planted, they may be very expeditiouſly covered by a pair of harrows being laſhed to a couple of poles at a proper diſtance to work on the tops of the ridges, and drawn by a pair of horſes; one going in each furrow, two ridges may be covered at a time, without the horſes ſtepping upon either.

A drill, which makes the furrows, drops the feed, and covers it at the ſame time, conveys an idea of much greater perfection than the method here adviſed; but all things conſidered, I do not know but in practice this may be the more eligible method of the two, eſpecially for beans and peaſe; and for ſetting potatoes and cabbage plants, I think it greatly preferable to all others. A furrow made as above is vaſtly preferable to any channel that
can

can be made with the share of a drill; for though the share be set to a certain depth at the discretion of the ploughman, from which it cannot deviate, yet if the soil be well pulverized, as it ought, it will run into the channels, and cause the seed to lie at unequal depths; this, in the autumn indeed, may be of no consequence, as at that season there is no danger of wanting moisture to make the seeds vegetate; but in the spring, it is of the utmost consequence to have the seed buried at an equal and proper depth; to the want of which, the very short crops of barley and oats were almost entirely owing the last summer. The seed that lay three or four inches deep came up well, and ripened in good time; but what lay shallow, either never came up at all, or, which was much worse, so late, as not to be any thing near ripe; it was therefore cut green, and lay so long to wither before it could be safely housed, that what little was ripe and would have been good, was much reduced in its value by laying so long in the field. I am very clearly of opinion, that if the barley last season had been drilled in equally distant furrows of four inches deep, and about a foot from each other, the crop in this country had been three times as great at least, though much less than half the seed would have been sufficient; this would have made a difference of three rents at least to the farmer.

The

The beans being planted, suppose the beginning of March, before the end of April a plentiful crop of weeds may be expected, notwithstanding the pains that have been taken to prevent it. Those which are in or near the rows of beans, should be cut up with the hand-hoe; and the sooner this is done the better, after the beans are high enough for the hoer's direction. The weeds in the intervals may stand somewhat longer, till the beans are sufficiently established in the ground, so as not to suffer from the free use of the horse-hoe. At this stage of their growth, this instrument should be introduced, and a furrow cut as near one of the ranks as may be with safety, and the earth thrown into the interval; on its return it must cut a furrow on the other side of the row, and so on till the whole field be finished. There will then be a furrow on each side of the rows, and high ridges in the middle of the intervals. These should be well harrowed, with an instrument made of a proper width to pass between the rows without injuring the beans. This would level the ground, break the clods, and tear out many of the weeds. A plough with a double mould-board is then to split the ridges in the middle of the intervals, throwing one half to the right, the other to the left, to earth up the beans. Thus disposed, it may remain for a month or six weeks, or till the weeds appear. Then the
hoe-plough

hoe-plough should be set to work again, always observing to go as near the rows as may be with safety. The harrow should follow the hoe-plough, and the plough with a double mould-board the harrow; and this is to be repeated as often as there may appear to be any occasion, which cannot well be more than three times in the course of the summer.

It makes no material difference whether the crop be beans, potatoes, or cabbage. That mode of practice which is beneficial to one, will be equally so to all. A field under this mode of culture, it is evident, would have all the advantages of a year's fallow, together with a beneficial crop. The beans being reaped and carried, the field would be thought by most to be in very good tilth for a crop of wheat. Nothing more would be necessary than to plough and harrow the intervals, which might be done with two bouts of the plough in each interval, in which two, three, or four rows of wheat might be drilled at the discretion of the owner. But I should prefer giving it another winter's fallow, which should be performed exactly in the same manner as the former. You may then either have another crop of beans, or, which I think much better, a crop of potatoes. The land is to be prepared and to lie fallow through the winter, as before directed for beans. The best
season

season for planting beans in March, but potatoes should not be planted before the middle of April at soonest; but in most years, the beginning of May is safer and better.

Last year I planted about three quarters of an acre the 15th and 16th of April; they came up well, and looked very fine and vigorous. On the morning of the 21st of May, there was a sharp hoar frost, which shrivelled up the greens of the potatoes as if they had been scorched by fire; the consequence was, the stalks died down to the ground, and appeared as if all destroyed; however, in some time they shot forth again, and produced a better crop, all things considered, than I expected. The produce was thirty-six sacks and a half on three quarters of an acre, (240lb. to the sack) which at four shillings a sack, (the present price here) come to 7l. 6s. being after the rate of 9l. 14s. 8d. per acre. Had this land been prepared in the manner above described, I cannot have a doubt but the produce would have been double at least. The land was in wheat the preceding year. I could not get possession till January 1785, and by reason of snow and hard frost, it could not be ploughed till late in March. It was thrown into narrow ridges, by two bouts of the plough; and the potatoe sets, instead of being planted in the furrows

made on the crowns of the ridges, as I had directed, were, by a most unaccountable blunder, very injudiciously dropped on the hard bottoms of the parting furrows between the ridges. I had no remedy left to correct this mistake, but by running the plough up each side of the furrow; by this means new ridges were formed with the potatoe sets exactly under the crown of each ridge, and the sets were well covered with mould very well broken; but still they lay on a bed of hard uncultivated earth, which is a very great impediment to vegetation; for though the potatoe generally grows above the set, the roots and fibres which furnish it with nourishment penetrate deep and every way in a well-prepared soil.

Nothing encourages and promotes the growth of all kinds of plants so much as breaking the soil as deep as the staple of the land will allow; and it is for this reason that I advise deep clean furrows should be opened, and the crown of the ridges, which are to be planted, should lie exactly over them. The furrows on the tops of the ridges need not be more than four inches deep for beans; but it must be six *at least* for potatoes; for almost the whole of their produce is above the original set, and therefore should have six or eight inches to grow in.

A field thus planted with potatoes following a crop of beans, if duly cultivated with the hoe-plough, harrow, and plough with a double mould-board, as above-directed, would reduce almost any soil to a perfect tilth. The intervals might be prepared in good time for a crop of wheat, and the seed drilled in, if convenient, before the potatoes were taken up.

Fallowing land has been generally practised to restore its fertility, especially where manure is not to be got in sufficient quantities; and all experience shews that the practice is right. But none have or can have an adequate idea of the great benefit of keeping the soil in a thorough pulverized state, except those who have paid a close attention thereto.

In a very hot and dry season, I have seen cabbage and other plants which were withering and dying, seemingly beyond a possibility of recovery, restored in a very short time to a vigorous state, merely by deep hoeing, and earthing them up well. I will quote one instance in particular, because it is a very remarkable one:—

The field above-mentioned of seven acres, I use for a field of experiments. About three quarters

of an acre of it I had dug with the spade, in order to mark the difference between that instrument and the plough. A plot of the ground thus dug was planted with beans, in rows three feet asunder, and about four inches apart in the rows. It was wheat stubble, very poor, and full of weeds, and dug but once. The beans came up well, but the season proved most unpromising. When three or four inches high, they appeared to be struck with the blight, and the tops were infested by a great number of insects, not unlike a large bug, which made great havock among, and threatened the destruction of the whole, for the plants declined fast. I thought a fair opportunity now offered of trying what benefit might be derived from effectual cultivation. I caused them to be deep and well hoed, and the earth drawn up to the stems of the plants; the good effects of this were soon visible, their verdure returned, and they tillered out afresh; the weeds too came up very thick and strong, and grew apace. I then had the intervals dug full ten inches deep, and the weeds in the rows pulled up. This gave fresh vigour to the plants, they kidded finely, and totally overpowered the weeds for that season. A few rows of these beans were gathered green for the use of the family, the remainder stood for feed. Many of them, especially those that were gathered green, put up fresh shoots from the roots,

roots, grew very strong, and even as full of bloom before winter as they had been in the summer. Many of them filled very well, and we had two or three dressings as good and as well flavoured as any of the summer. To have two crops of beans from the same roots, is, I believe, a very uncommon instance of vegetation, and certainly was owing to nothing but well-timed and effectual hoeings and digging the intervals. The remainder of the plot stood for seed; the season for getting them in being rather unfavourable, some of the pods opened, and the beans dropped. As soon as they were housed, the ground was well dug to prepare it for a winter crop. The beans that were scattered were dug in unnoticed, and before the end of November were shot up two feet high, very strong and luxuriant. I took up several of them carefully, to observe the progress of their growth. The beans from which they shot firmly adhered to the stalk, from whence it appeared, that in digging the ground some of them had been buried seven or eight inches deep, it being so much from the bean to the surface of the ground, and this, instead of a stalk, had put on the appearance of a root, and was full of lateral branches and fibres the whole length. Below the bean the root had penetrated, in some eleven, in others twelve inches. How much of the fine fibres might be broken off cannot be known. Cer-

tain it is, however, that the perpendicular growth of these roots was from eighteen to twenty inches; whereas those that were planted in the spring on the same soil, much out of condition, very foul, and but once dug, had struck only about three inches deep at most. Here then we have ocular demonstration of the surprising effects which breaking, dividing, and pulverizing the soil, can produce, if done effectually, and in proper season. How amazingly great must be the luxuriance of a plant whose root is twenty inches long, and full of fibres the whole length, if compared with one of the same kind whose root is only three inches long, and proportionably small!

Another plot of the same field I planted with egg pease; they came up well, but when a few inches high, were struck with the blight, and devoured by insects down to the ground. I began to dig them up, in order to plant something else in their room; but observing the roots had begun to put out fresh shoots, I took the man off digging, and set him to hoeing the intervals very deep. They soon shewed the good effects of this operation, they shot up vigorously, and produced not a large crop indeed, but very fine large pease. When they were nearly spent, I had the ground well dug again, and planted some hundreds of cabbage
plants

plants of different kinds. To these I gave two or three good hoeings, and in October had the finest cabbages in the neighbourhood. Perhaps many might be larger and heavier, the average weight of mine being from six and a half to seven pounds; but nothing could exceed them in sweetness and goodness. What makes this the more remarkable is, the farmer who last occupied the land told me it would not bear a cabbage, the soil was so shallow, poor, and liable to burn.

As soon as the cabbages were cut, I had it dug again, and planted it with brocoli; the plants grew luxuriantly, and were as healthy and fine as ever were seen, till the severe frosts the beginning of January instant gave them a severe blow. Before the snow fell, they dropped their leaves, and seemed much hurt; whether they will recover, as I hope, will appear hereafter; they are now covered with snow.

The condition as well as complexion of this part of the field (three quarters of an acre) is very much altered for the better; it has now the appearance of good garden mould, is light, easy to dig, and crumbles with great ease. This improvement of the soil is wholly owing to the culture bestowed upon it. In the course of twelve months it has been dug three times, and hoed or dug with a dung-fork with

with four tines (which is the best instrument I know of for shaking the weeds out of the soil) at least four times, but it never had a grain of manure of any kind whatever; that I purposely withheld in order to prove to what degree of improvement land might be brought by the force of cultivation solely. Hitherto the success has greatly exceeded my expectation; if the success of another year upon this same part of the field should prove superior, or even equal to the last, the fact will be established beyond the possibility of a doubt, that land in its nature rather unfertile, impoverished, and made very foul by bad management, may, by the proper use of the spade and hoe, or the plough and harrow, be made fertile, and to bear profitable crops, without the least aid from manure of any kind whatever.

It has been observed by Mr. TULL, and by others since his time, that frequent ploughing and harrowing, and reducing the soil to a perfect tilth, increase and extend the pasture of plants; but this could be of no great use, if the matter or substance which constitutes their aliment were not increased also. During the course of these experiments, I made several observations, which clearly explain to my own satisfaction, how dividing and pulverizing the soil becomes the proper mode of conveying the aliment, prepared by nature for the sustenance of plants,

plants, into the bosom of the earth. One observation I will mention, as it is directly to the purpose: one evening, near the time of the men's leaving work, a smart shower of rain came on, which drove them off. They were digging one of the plots where the beans had grown. The shower did not last above half an hour. The next morning, as the men were digging, I observed the rain had not penetrated above half an inch into the ground at most; I ordered one of them to dig two or three spits of the ground that had been dug the day before; it clearly appeared that the rain in the new-dug ground had gone as deep as the spade, which was full twelve inches. Here then, we clearly see how, and by what means, the principles of vegetation are acquired, by keeping the land in thorough cultivation.

Rain, hail, snow, dews, hoar frost, and all the exhalations which occupy the atmosphere, sink into and are absorbed by the earth when it is kept in a loose, light, pulverized state; whereas the same principles on a compact hard soil reach no farther than the surface, and are exhaled by the sun and wind, with little or no benefit to the soil they fall on.

From hence also we may learn the *modus operandi* by which plants in a growing state may be invigorated

gorated and rendered luxuriant. If plants of any kind were planted in rows, according to the practice of the new husbandry, and the intervals hoed two or three times in the summer; every shower of rain, yea, the dews of the nights, would be freely imbibed by the well-pulverized soil, and the aliment it contains directly conveyed to the roots and fibres of the plants which occupy the intervals.

That the true aliment of plants is derived from animal substances, dissolved and volatilized by fermentation and putrefaction; that the atmosphere is the grand receptacle of all putrid effluvia; that this subtilized matter enters into, and helps to constitute, the clouds and other meteors; that it attracts, and is attracted by, hail, rain, snow, &c. and by that means returned to replenish and fructify the earth; the writer himself is fully convinced. But supposing his theory respecting the principles of nutrition be ever so erroneous, it is of no consequence to the practical husbandman; it is sufficient for him to know and to be well acquainted with a mode of practice which will infallibly render his fields fertile, and capable of producing profitable crops, by means easily practicable and within his own power, be the situation and condition of the soil whatever it may, total barrenness excepted.

That

That fallowing gives fertility to the earth, is a fact confirmed by universal experience, and well known to every husbandman: but the extent of its power has been considered by few, and attempted to be carried to its utmost pitch perhaps by nobody. I am of opinion, that even Mr. TULL's mode of practice would admit of very considerable amendments. But this Paper is much too long to allow of any large addition.

I am, &c.

*North-Bockhampton,
Hants, January 1786.*

JOS. WIMPEY.

N. B. We acknowledge ourselves much indebted to Mr. WIMPEY for the foregoing (as well as divers former) valuable papers. He will therefore excuse our subjoining the following remarks, made by an ingenious gentleman, who has enriched our work with many interesting practical papers; and to whom the Essay was referred.

R E M A R K S.

“ Mr. WIMPEY's Practical Enquiry has afforded me much instructive amusement. I never so nearly agreed with any other practical or theoretical farmer. His Essay is so deserving of the highest encomiums, that it is with reluctance I make any comment thereon which may seem to clash with any of his opinions. But by my pointing out the
only

only few trifling circumstances in which we differ in judgment, you will see how generally consonant our ideas are with each other.

“ Mr. W. thinks that ‘ all land may be fertilized and improved by frequent ploughings and harrowings, if well timed.’ But it appears from experience, that many *light* and *thin* soils receive detriment rather than advantage from frequent ploughings; particularly in summer, when the sun exhales the oleaginous and nutritive particles in great abundance. The experience of Mr. BILLINGSLEY (who, without a compliment, is one of the best farmers in the West of England) exactly coincides with my own in this respect.

“ Mr. W. says, ‘ Turnips, lucern, sainfoin, and clover, are very precarious crops.’ All crops, with imprudent management, or in very unkindly seasons, must be precarious; but I do not think the term *precarious* particularly applicable to those above-mentioned, turnips excepted; and the instances of a material failure, even of that crop, are very rare in the Eastern counties. Lucern, unless sown in drills, and kept clean from weeds, will never answer to the farmer; but when judiciously managed, nothing is more profitable. Clover seldom fails, unless in patches on wet lands, which want under-draining; and it is an excellent preparative for wheat.

“ Mr. W. has given you an excellent method of raising a large quantity of manure. I have for many years adopted a mode nearly similar, only substituting the spade instead of the plough in preparing my border and head-lands for
the

the lime and dung. In the spring I have them dug deep and well, the workman dropping potatoe sets, and covering them as he goes on. The crop more than pays the expence of digging, and leaves the land clean and finely pulverized.

“ I think equidistant rows of twelve inches too wide for barley; having tried various experiments from three to twelve inches with that grain, from the general result, I prefer seven inches to every other distance. I wish, for the benefit of your Society, and the nation at large, you had many such correspondents as Mr. WIMPEY.

“ H. J. CLOSE.”

ARTICLE XXV.

On Raising, Planting, and Cultivating the Turnip-rooted Cabbage; on the Six-Field System; and some cursory Remarks on Agriculture.

[In a Letter to the Secretary.]

SIR,

THE best method I have yet discovered to raise the plants of the turnip-rooted cabbage, is to breast-plough, and turn as much old pasture as may be judged necessary for the feed-bed; two perch well stocked with plants, will be sufficient to plant an acre.* The land should be dug as

* See Sir THOMAS BEEVOR's letter, page 110.

shallow

shallow as possible, turning the ashes in; and the seed should be sown the beginning of April.

The land intended for the plantation should be cultivated and dunged as for the common turnip. About Midsummer, (or sooner if the weather will permit) will be a proper time for planting, which is best done in the following manner: the land to be thrown into *one-bout* ridges, upon the tops of which the plants are to be set, at about eighteen inches distance from each other. As soon as the weeds rise, I give a hand-hoeing, afterwards run my plough in the intervals, and fetch a furrow from each ridge, which, after laying a fortnight or three weeks, is again thrown back to the ridges; if the weeds rise again, I think it necessary to give them another hand-hoeing.

N. B. If the young plants in the seed-bed should be attacked by the fly, sow wood-ashes over them when the dew is on, which will effectually prevent the ravages they would otherwise make.

On the Six-Field System.

As I have tried different systems of agriculture, and found the following method best adapted to our poor lands, I have taken the liberty to present you with an account of it.

It

It is what we generally call a *six field system*.* As I look upon turnips to be the grand basis upon which the best superstructure of practical husbandry can be raised, I shall begin with them.

1st year, Turnips,

2d year, Barley, with grafs seeds.

As our lands have been sown so frequently with broad clover as to become tired with it, I have substituted the following mixture in its place, viz. four pounds of white Dutch, six pounds of marl grafs, and one bushel of hop and ray-grafs, which I have found to succeed.

3d year, Grafs,

Mown, not suffering any cattle to be depastured on it later than October; as I have seen many a good plant of grafs destroyed by winter feeding.

4th year, Feed.

5th year, Wheat.

The land lying under grafs two years, it gets close, and will be a means to prevent the wheat from what is generally called *foudering* in the spring.

* This *six-field system*, or, system of a course of crops for six years, is a most excellent one; and its utility is further proved by the general practice of the best farmers in Suffolk and Norfolk, upon similar soils; but it is customary in those counties to break up the layer in the spring of the fifth year, and dibble in pease; and sow wheat in the sixth year after the pease; as they find the wheat generally better after a crop of pease, than when sown or planted upon the layer; and they think the land less exhausted by a crop of pease succeeded by wheat, than by a crop of oats following the wheat.

6th year, Oats;
After which, Turnips.

As the getting a crop of turnips is the foundation on which you may most reasonably build your future hopes of success, it is a part of husbandry to which the farmer cannot pay too much attention. The method I advise is, to carry all the rotten dung and manure upon your oat-stubbles immediately after harvest, (which should be the dung made in your courts the preceding year) after which plough it in; give another ploughing in March if possible; you will be then provided for an early sowing, which, in my opinion, is the most probable way of succeeding in your turnip crop.†

As turnips upon poor lands cannot be raised without dung, I take it to be the farmer's interest to collect as much as possible, not suffering any

† The propriety of manuring the land for the turnip crop is indisputable; but if the dung be laid on the stubble directly after harvest, it will lose much of its strength before the season of turnip sowing. The Suffolk and Norfolk farmers generally carry their manure out of their farm-yards in the spring, as soon as the cattle quit them; and by turning it over once about a month afterwards, it becomes sufficiently rotten to be laid on the ground immediately before the turnips are sown. By this method abundant crops are produced.

straw,

straw, haulm, or stubble, to pass without being converted to manure; as upon the quantity and application of *that* depends in a great measure his future success.

The wheat stubble [haulm] should be mown and collected together to some convenient place, as near to the land intended for turnips the next season as convenient; and, being stacked round the sheep-fold, will not only be of great benefit to the cattle as a shelter, but will be found very useful as a comfortable lodging for them.

I am aware of one objection that may be made to this method of bedding up cattle all the winter, which is, that the heat arising from the fermentation will make the cattle tender and delicate in their constitutions; but this, like many other things which at first appear an evil, may by proper attention be converted into the greatest good, by laying on at proper times a layer of earth or mould from ditches, highways, &c.*

After the compost has early in the spring been turned up, this fermentation will be found to have converted it to a valuable heap of manure, and its

* Such a fixed fold may be of great use when the weather is too bad to fold the flocks in the fields; at other times the land will be more benefited by folding the sheep upon it.

vicinity to the land where it is intended to be used must still add to its value.

If manure could be conveniently procured to give a top-dressing to the grafs seed, as soon as the corn is carried, I am persuaded the farmer would be amply paid for his expences in the succeeding crop.

I beg leave to subscribe myself, with best wishes for the prosperity of the Society,

Your obliged humble servant,

THOMAS ROBINS.

Bolt-Down, Gloucestershire,

January 7, 1785.

ARTICLE XXVI.

Experiment on Horse-boed Wheat.

[In a Letter to the Secretary.]

SIR,

A GREEABLE to my promise, I now transmit to you an accurate account of my *horse-boed* wheat with a comparative estimate of a full crop in the adjoining field.

The

The following experiments were made in two fields now parted by a ditch, but formerly in one piece, containing in the whole eleven acres; at this time they are in a six and five-acre close. The six-acre field, after yielding two large crops of clover, was ploughed October the 18th, 1782, and on that and the following days planted with wheat on the first earth, allowing one bushel of seed to each acre. In May following, the crop was properly cleaned by hand-hoeing. On the 12th of August twelve reapers cut it. After standing a proper time in the field, it was brought home; and upon threshing it, the six acres produced only eighty-four bushels.

Oct. 16th, 17th, 1782, the adjoining five-acre field was *set* in ridges, planting two feet, and leaving two feet intervals, with two pecks of seed-wheat per acre; ten pecks the whole field. It was hand-hoed and cleaned in the same method as the other crop, except that the intervals were *horse-bred*. It was reaped one day-sooner, stood in the field the same time, and was threshed by the same labourers. The crop produced $128\frac{1}{2}$ bushels. This wheat succeeded a crop of potatoes, not manured for, but twice horse-hoed. The tines of the frames made use of in planting were three inches and a half apart. There is at this time a very promising prospect of a good crop on the last year's intervals.

Expences of the Six-Acre Field:

	£.	s.	d.
Planting, (at that time 10s. per acre, but now done at 6s.) — — —	3	0	0
Hand-hoeing and weeding —	3	0	0
Six bushels of feed at 6s. 3d. — — —	1	17	6
Rent of land — — —	6	0	0
Tithe 1l. 4s. Town charges 15s. —	1	19	0
Harrowing to cover the feed —	0	1	6
Reaping and carting home — — —	1	16	0
Threshing at 18d. a coomb, because the crop was mildew'd — — —	1	11	6
Carting three miles to market —	0	10	6
Total expence	£.21	0	0
Received for 84 bushels, at 6s. per bushel	25	4	0
Nett profit from the six acres only	4	4	0
besides straw worth two guineas.			

Expences attending the Five Acres, in the horse-hoeing husbandry.

Planting — — —	£.1	5	0
Hand-hoeing and weeding —	1	5	0
Two bushels and a half of feed — — —	0	15	7½
Rent of land — — —	5	0	0
Tithe 20s. Town charges 12s. 6d. —	1	12	6
Twice ploughing — — —	1	15	0
Harrowing before and after planting	0	2	6
Reaping and carting home —	1	5	0
Carried on	£.13	0	7½

	Brought up	£.13	0	7½
Threshing sixteen quarters	—	1	12	0
Horfe-hoeing the intervals	—	0	9	0
Carting to market	—	0	16	0
Total expense		£.15	17	7½
Produce 16 quarters, sold at 48s. per qr.		38	11	0
Value of straw	—	2	9	0
		41	0	0
Expences as above		15	17	7½
Nett profit		£.25	2	4½

Both these crops were damaged by the mildew; but the five-acre field less than the other. The six-acre field, however, had it received no such injury, would never have yielded in any proportion to the other; as it produced in the straw only six fair driving waggon loads; whereas from the five-acre field I had seven loads larger than are commonly laid up in harvest time, although only half the land was planted. I am, &c.

Trimley, near Ipswich,

H. J. CLOSE.

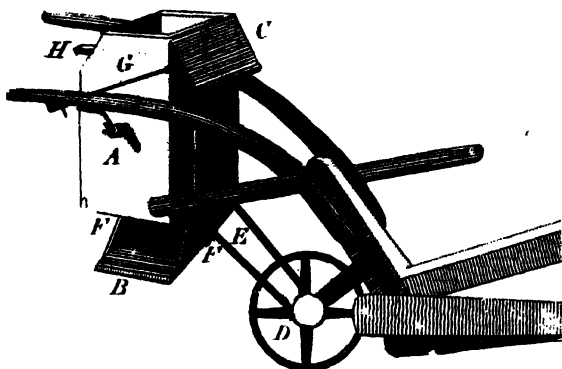
May 18, 1784.

In a letter from Mr. CLOSE, dated February 1786, relative to the experiment on the five-acre crop above related, he adds as follows:—

“ Since the above experiment was made, there have been two more crops of wheat taken from the field of five acres. In 1784 it produced six quarters per acre; in October 1785 the burthen in the straw was not quite equal to the former year; but the ears being remarkably large and long, (some of them measuring 8 inches, and many containing 70 grains of corn) I think the crop, though not yet threshed, may be safely estimated at six quarters per acre. This will make the return from the three years crops on the five acres, (with half the expence for seed, reaping, &c. without any assistance from manure, for which tillage has been substituted) amount to the sum of 110l. 11s. or 36l. 17s. each year; a receipt far exceeding my most sanguine expectations.

Pulverizing the land is wonderfully efficacious in stiff loamy soils; but in light, sandy, and thin lands, too much ploughing will prove detrimental.

I have very considerably reduced the expence of planting wheat within these three years; it now amounts to no more than 6s. 4^d. per acre, with a frame having seven tines, or teeth; but I prefer a frame with only five, which reduces it 1s. 6d. more per acre, and makes the present price but 4s. 10^d. per acre.



BY THE
KING'S ROYAL PATENT
THE UNIVERSAL
SOWING MACHINE.



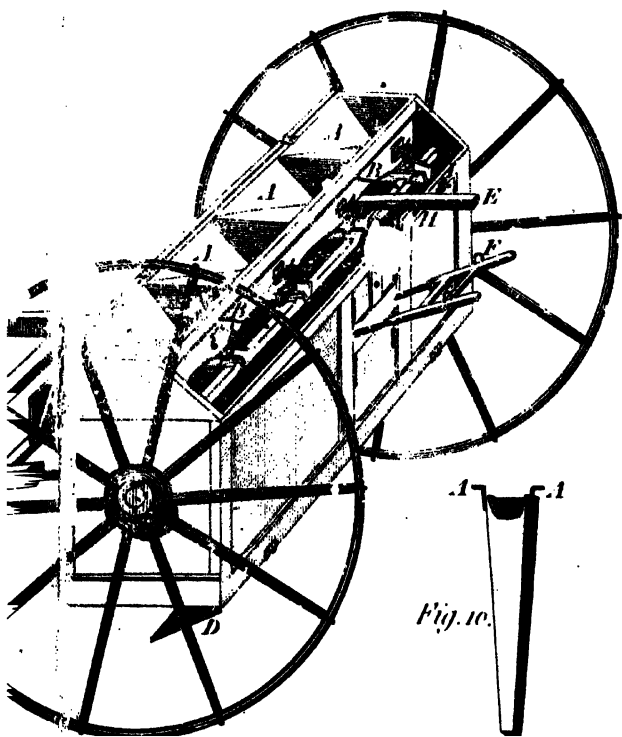
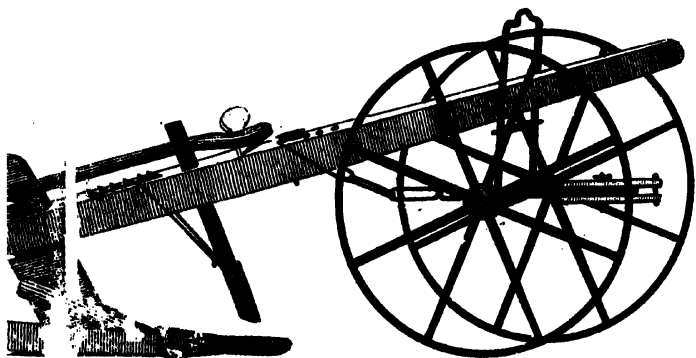


Fig. 10.

Fig. 3.

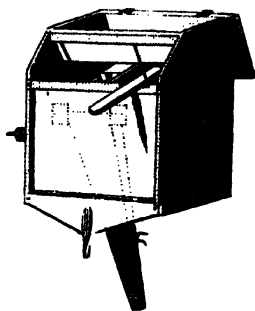


Fig. 1.

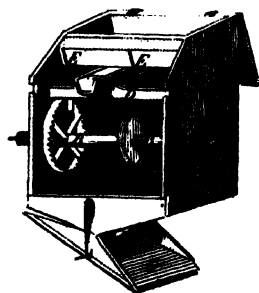


Fig. 7.

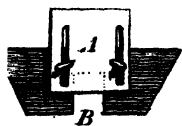


Fig. 6.



Fig. 5.

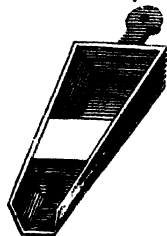


Fig. 8.

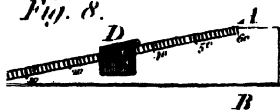
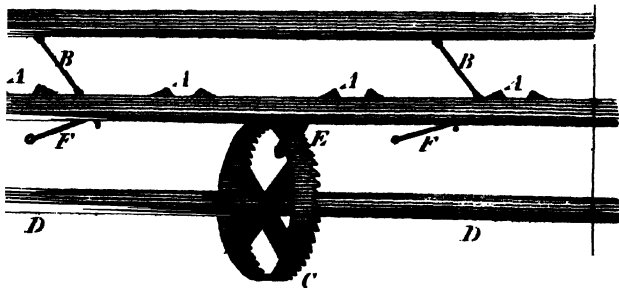


Fig. 9.



ARTICLE XXVII.

Description and Use of the new-invented Patent Universal Sowing Machine, for Broad-casting or Drilling every kind of Grain, Pulse, and Seed.

[By Mr. JOHN HORNE, of Dover.]

THIS Machine, whether made to be worked by hand, drawn by a horse, or fixed to a plough, and used with it, is extremely simple in the construction, and not liable to be put out of order; as there is but one movement to direct the whole, nor does it require any skill in working. It will sow wheat, barley, oats, rye, clover, cole-seed, hemp, flax, canary, rape, turnip, besides a great variety of other kinds of grain and feeds, broadcast, with an accuracy hitherto unknown. It is equally useful in the new husbandry, particularly when fixed to a plough; it will then drill a more extensive variety of grain, pulse, and feed, (through every gradation, with regard to quantity) and deliver each kind with greater regularity than any drill-plough whatever. When used in this manner it will likewise be found of the utmost service to farmers who are partial to the old husbandry, as, among many other very valuable and peculiar properties, it will not only sow in the broadcast way with a most singular exactness, but
save

save the expence of a seedsmen; the seed being sown, (either over or under furrow at pleasure) and the land ploughed, at the same operation.—It is needless to mention the very great benefits that arise to the crop, from the seed being equally distributed upon the land, it being already sufficiently known.

The prices of these machines* are brought within the reach of the smallest farmer; but were they much higher, it could not in the least weigh against the advantages derived from them, as more than double the price of one may be gained, by using it a single season on a very small number of acres.

Perhaps a fair and decisive experiment for ascertaining the superior advantage of broadcasting or

* The prices of the machine (exclusive of the packing cases) are as follow: If constructed to be used with a single furrow plough; the wheel, with the axle and cheeks steered, strap, regulator, brass plates for broadcasting or drilling turnips, lucern, tares, wheat, barley, &c. &c. &c. and every article necessary for fixing it, included, Three Guineas and a Half. If made with a spring, (for sowing on the side of a hill, where the slope is considerable) but which is very rarely necessary, Five Shillings more. If made to be fixed to any double furrow plough, Four Guineas and a Half.

The large machine, Fig. 2, Plate I. when made to broadcast seven furrows at a time, and to be drawn by a horse, Eight Guineas and a Half. If constructed to sow five furrows at a time, and to be used by hand, Six Guineas. There are also Five Shillings more, if made with a spring.—Orders to be addressed to J. HORNE, the patentee at Dover; Mr. PEARSON, No. 169, Fleet-street, London; or to Mr. W. MATTHEWS, Bath.

drilling

drilling any particular crop, was never before so practicable; as the seed may now be put in with the utmost degree of regularity, in both modes of culture, by the same machine; consequently, the seed will be sown in both cases with equal accuracy, without which it is impossible to make a just decision.

As the broadcast method of husbandry is by far the most generally practised, and has long been considered the most productive, it may appear strange upon reflection, that no machine has hitherto been made for the purpose of broadcasting with certainty; when we find so many ploughs for drilling.

The excellence of this machine consists in spreading any given quantity of seed, over any given number of acres, with a mathematical exactness, which cannot be done by hand; by which a great saving may be made in feeding the ground, as well as benefiting the expected crop.

There has always been a difficulty in sowing turnip seed with any degree of exactness, both from the minuteness of the seed, and the smallness of the quantity required to be sown on an acre. Here the machine has a manifest advantage, as it may be set to sow the least quantity ever required on an acre; and with an accuracy the best seedsmen can never attain to.

It

It will also sow clover, cole, flax, and every other kind of small seed, with the utmost degree of regularity.

It will likewise broadcast beans, pease, and tares, or drill them with the greatest exactness, particularly when constructed to be used with a plough.

Another advantage attending the use of this machine, is, that the wind can have no effect on the falling of the seed.

*Of the Machine when made to be used without a Plough,
and to be drawn by a Horse.*

THE Machine in this case may be made of different lengths at the desire of the purchaser. The upper part A A A A, see Fig. 2. Plate I. contains the hoppers, from which the grain or seed descends into the spouts. The several spouts all rest upon a bar, which hangs and plays freely by two diagonal supporters B B, a trigger fixed to this bar bears against a catch-wheel: this, being fixed on the axle, occasions a regular and continual motion, or jogging of the spouts, quicker or slower in proportion to the pace the person sowing with it drives; and of course, if he quickens his pace, the bar will receive a greater number of strokes from the catch-wheel, and the grain or seed will feed the faster. If he drives slower, by receiving fewer strokes, the contrary must take place. In going along the side of a hill, the strength of the stroke is corrected by a spring which acts with more or less power, in proportion as the machine is more or less from a horizontal position, and counteracts the difference of gravity in the bar, so that it presses, in all situations, with a proper force against the catch-wheel. This spring is unnecessary if the land be pretty level.

At the bottom of the machine, is placed an apron or shelf in a sloping position, and the corn or seed, by falling thereon from the spouts above, is scattered about in every direction under the machine, and covers the ground in a most regular and uniform manner.

To sow the corn or seed in drills, there are moveable spouts, (see Fig. 10.) which are fixed on, or taken off at pleasure, to direct the seed from the upper spout to the bottom of the furrow.

The machine is regulated for sowing any particular quantity of seed on an acre, by a brass slider, A, fig. 7, fixed by screws against a brass bridge on each of the spouts. The machine is prevented from feeding while turning at the ends, by only removing the lever E, Fig. 2, out of the channel G, to another at H, on the right hand of it, which carries back the bar from the catch-wheel, and occasions the motion of the spouts to cease, and at the same time brings them upon a level, by the action of the diagonal supporters; so that no corn or seed can fall from them.

The machine in this form is particularly useful for broadcast-sowing clover upon barley or wheat; or for sowing any other kind of seed, where it is necessary that the land should first be harrowed exceedingly fine and even.

Manner of using the Machine, when drawn by a Horse.

PLACE the machine about two feet from the ends of the furrows where you intend it shall begin to sow. Fill the hoppers with seed, and drive it forward with the outside wheel in the first furrow. When you are at the end of the length, at the opposite side of the field, lift the lever E, Fig. 2, into the channel H, and the machine will instantly stop sowing. Drive it on about two feet, and then turn. Fill the hoppers again if necessary; then remove the lever back again into the channel G, and in returning, let the outside wheel of the machine go one furrow within the track which was made by it, in passing from the opposite end: As for example, if the wheel passed down the eighth furrow from the outside of the field, let it return in the seventh;

seventh; and in every following length let the outside wheel always run one furrow within the track made by the same wheel; because the breadth sown is about nine inches less than the distance between the wheels.

Let the machine be kept in a perpendicular situation. If the farmer wishes to sow more or less seed on any one part of the field than the other, it is only raising the handles a little higher, or sinking them a little lower than usual, and it will occasion a sufficient alteration; and should the last turn be less in breadth than the machine, those spouts which are not wanted, may be taken up from the bar, and prevented from feeding, by turning the knob above them.

Also, when the land required to be sown has what is called a vent, that is, when the sides of the field run in an oblique line to the furrows, which by this means are unequal in length; the spouts must be taken up or let down in succession by turning the knobs; as that part of the machine, where they are placed, arrives at the ends of the furrows. This is done while the machine is going forward.

If the land be tolerably level, the machine may be fixed by the screw in the front, and may then be used by any common harrow-boy.

Method of regulating the Machine.

IN each spout is fixed a bridge, see Fig. 7, with an aperture in it, B, for the grain or seed to pass through. This aperture is enlarged or contracted by a slider, A, which passes over it; and when properly fixed for the quantity of seed designed to be sown on an acre, is fastened by means of two strong screws, firmly against the bridge. This is made use of in sowing all kinds of seed, where it is required to sow from one bushel upwards on an acre. To sow one, two, three gallons, or any of the intermediate quantities, as of clover, cole-seed, &c. the brass plate, fig. 6, is placed between the bridge and the slider, with the largest aperture

ture B downwards, which aperture is enlarged or contracted by the slider as before. To sow turnips, the same plate is placed between the bridge and the slider, with its smallest aperture A downwards, and the hollow part about the same aperture inwards.

FIG. 8, is a view of the regulator, by which the apertures in the several spouts are all set exactly alike, with the utmost ease, to make them feed equally. The extreme height of the largest aperture is equal to the breadth A B, and the breadth at C is equal to the height of the smallest aperture used, viz. that for turnips. The side A C, is divided into 60 equal parts, and on it moves the slider or horse D; which being placed at any particular degree, according to the quantity of seed required to be sown on an acre, is fixed upon it, by a screw on the side of the slider or horse. When this is done, the end of the regulator is put through the aperture in the bridge or plate (whichever is intended to be used) and the slider against the bridge in the spout raised by it, till it stops against the horse on the regulator; then the slider is fastened against the bridge firmly by the two screws; care being taken at the same time, that it stands nearly square.

By this means the spouts (being all fixed in the same manner) will feed equally.

It is easy to conceive that the size of the apertures, and consequently the quantity of seed to be sown on an acre, may be regulated with a far greater accuracy than is required in common practice.

The spouts may be regulated with the utmost nicety, in five minutes, to sow each particular seed, for the whole season. But a little practice will enable any person, who possesses but a very moderate capacity, to make the spouts feed equally, even without using the regulator.*

* Proper directions are given with each machine for using it, as also for fixing the sliders to sow any particular quantity of corn or seed on an acre: so as to enable any person to set the spouts.

Of the Machine, when made to be used by Hand.

THE difference of the machine in this case is, that it is made lighter, with but three spouts, without shafts, and is driven forward by the handles. It hath also a bolt in front, which being pushed in by the thumb, releases the machine: so that it can then easily be placed in a perpendicular position. This alteration is necessary to keep the handles of a convenient height, in sowing up and down a hill, where the slope is considerable; and is done while the machine is turning at the end of the length. —The method of regulating and using it, is the same as when made to be drawn by a horse.

Of the Machine, when constructed to be used with a Plough.

THIS is, without doubt, the most useful application of the machine: and it can be fixed without difficulty to any kind of plough, in the same manner as to that represented in Plate I.

The advantages arising from the use of it are great and numerous; for, beside the increase in the crop, which will be insured by the seeds being broad-cast with a mathematical nicety; a large portion of seed, (the value of which alone, in a few months, will amount to more than the price of the machine) and the seedsman's labour, will be saved. The seed may likewise be sown either under, or over furrow; or one cast each way, as is practised by some farmers. The seed also, being cast by the machine upon the fresh ploughed land, may be immediately harrowed in, before the mould has lost any part of its moisture; which in a dry season will greatly promote the crop. In drilling any kind of grain, pulse, or seed, it possesses every property that can be wished for in the best drill-plough, nor will it (as most of them do) bruise the seed, or feed irregularly. The construction of the machine is the same as the large ones, except being made with one hopper and spout instead of several, and the apron moveable instead of being fixed, as may be seen by inspecting Fig. 4.* The only alteration necessary, to make the machine

* See also the References.

broad-cast, or drill, is, in the former case to place the Apron B, Fig. 1, at the bottom of the machine, on the hooks FF, sloping, either towards the furrows, or the imploughed land, according as it is intended to sow the seed, either over or under furrow.*

To prepare it for drilling, instead of the apron, place the long spout, Fig. 10, upon the brackets, on the front of the machine, by the ears A A, to receive the seed from the upper spout, and fasten the lower end of it, by a small cord, to that hook upon which the apron is hung for broad-casting, which is next the plough, see Fig. 3; the seed will then be directed by the long spout, to the center of the furrow, near the heel of the plough. The spring for correcting the strength of the stroke, is necessary only when they are required to go along the side of a considerable declivity. The machine, when fixed to a plough, does not require the smallest degree of skill in using, as nothing is necessary but to keep the hopper filled.† The accuracy with which it will broad-cast, may in some measure be conceived, by considering that the seed regularly descends upon the apron or shelf, and is from thence scattered upon the ground, in quantity exactly proportioned to the speed of the plough: also that each cast spreads to the third furrow; and by this means shuts upon the last. In this manner it is continually filling up, till the whole field is compleatly covered: so that it is impossible to leave the smallest space without its proper quantity of seed.

When the plough is wanted for any other purpose, the machine, with the wheel at the heel of the plough for giving it motion, can be removed or replaced, at any time in five minutes.

PLATE II. represents the machine fixed to a double-furrow creasing plough, and prepared for drilling. As this plough may not be generally known, it will not be improper to observe, that it is chiefly used for creasing the land with furrows, (after it has been once ploughed and harrowed) which method is necessary,

* Whenever the apron is required to be shifted, it is done in less than a second of time; as it only requires to be moved up or down, with the hand, when a catch fixes it.

† The hopper will contain a sufficient quantity of seed to go upwards of 140 rods, before it will want refilling, when three bushels and a half are sown on an acre.
when

when the seed is to be sown broadcast upon land that has been a clover-lay, &c. because, if the seed be thrown upon the rough furrows, a considerable part of it will fall between them, and be unavoidably lost, by lying too deep buried in the earth. This mode answers extremely well, and partakes of both methods of culture; the seed, tho' sown broadcast, falling chiefly into the furrows.

The machine is very useful for sowing in this manner; as the seed is broadcast, with an inconceivable regularity, at the time the land is creased. The advantages it likewise possesses for drilling all sorts of grain or seed with this plough, are too evident to need mentioning.

The machine, when constructed to be used with a double-furrow plough, is made with two upper and two long spouts for drilling, two aprons for broadcast, and with a double hopper, but in other respects the same as when intended for a single furrow plough: it is used, in all cases, with the greatest ease imaginable.

The interval between the points of the two shares of a creasing plough is usually ten inches; the beam about nine feet long; and the whole made of a light construction.

It is perhaps necessary to remark, that with the use of the machine, no new theoretical system of husbandry is intended to be introduced; the use of it is recommended, to assist the farmer in the practical part of his business only, and to enable him to make his land produce the largest crops possible, with the least expence, whatever be the mode of culture he chuses to follow. The machine is in every respect calculated for common use; it is very durable, and cannot without great violence be put out of order. The principles upon which it acts are likewise extremely simple, and no way depending upon nice mechanism.

REFERENCES TO PLATE I.

FIGURE I.

The machine fixed to a Kentish turn-rest plough.

- B. The apron, upon which the seed falls and rebounds upon the land, in broadcasting.
- C. Lid to cover the hopper.
- D. Wheel at the heel of the plough.
- E. Strap.
- FF. Hooks, upon which the apron turns by a pivot on each side.
- G. Stay, to keep the machine steady.
- H. Lever, to prevent it from sowing.

FIGURE II.

The machine constructed to be drawn by a horse.

- A A A A. The hoppers.
- B B. The diagonal supporters.
- C C C C. The upper spouts. [spouts.]
- D. The apron or shelf upon which the seed falls from the upper
- E. The lever, which carries back the bar, and prevents the machine from sowing.
- FF. Staples upon the handles, through which the reins pass, for the man who conducts the machine to direct the horse by.
- I. Screw, to fix the machine occasionally.
- ☛ The knobs (by turning which each particular spout may be taken from off the bar, and thereby prevented from feeding) are over each upper spout, but (to prevent confusion) are not lettered in the plate.

FIGURE III.

Is the same machine with that in FIG. I. The dotted lines expressing the situation of the long spout, when the apron is removed, and the machine adapted for drilling.

FIGURE IV.

Same machine, front laid open to shew the inside.

- A. The catch-wheel fixed upon the axle.
- B B. The axle, upon which the machine hangs between the handles of the plough.

- C. The pulley, by which the strap from the wheel at the heel of the plough turns the catch-wheel.
- D. The bar, upon which the upper spout rests, suspended by the diagonal supporters E E, bearing against the catch-wheel by the trigger F, and thereby kept in motion, while the plough is going.
- G. The apron in a sloping position, upon which the corn or seed falls from the upper spout, and is scattered by rebounding upon the land. It turns upon pivots, and by this means throws the seed either towards the right hand or left at pleasure.

FIGURE V. The upper spouts.

FIGURE VI. The plate, which is placed between the bridge and the slider, for sowing small seeds. The aperture A being downwards, for sowing turnips; the larger one B downwards, for sowing clover, &c.

FIG. VII. The bridge, fixed in the upper spouts.

- A. The slider, which contracts or enlarges the different apertures.
- B. The aperture in the bridge, through which the seed passes, when sowing any quantity from one bushel upwards on an acre.

FIG. VIII. The regulator, made of brass.

- D. The slider or horse which moves upon it, and is fixed at any particular degree by a screw in its side.

FIG. IX. represents the movement in the machine Fig. II.

- A A A A. Cleets, between which the upper spouts rest.
- B B. The diagonal supporters, by which the bar with the upper spouts hang.
- C. The catch-wheel.
- D D. The axle.
- E. The trigger upon the bar, which bears against the catch-wheel.
- F F. Stays from the back of the machine, by which the bar passes.

FIGURE X. The long spout.

- A A. The cars by which it hangs.

The

The three following Letters relate to a subject of so interesting a nature to the peace and welfare of the community at large, that although they do not come immediately within the plan of our publication, we think no other apology necessary for inserting them.

ARTICLE XXVIII.

An account of the Origin, Progress, and Regulations, with a Description of the newly established Bridewell, or Penitentiary House, at Wymondham, in Norfolk.

LETTER I.

From Sir THOMAS BEEVOR, bart. to the Secretary.

SIR,

ONE avocation in which I have lately been engaged, I will relate to you. Having read Mr. HOWARD's book describing the state and condition of our prisons, it naturally led my thoughts to that subject. The idea that *as many prisoners died yearly in England by the gaol distemper as by all the executions put together*; and the accounts of the dissoluteness and profligacy, which by the intermixture of them were learnt and practised in those places of confinement; determined me to attempt, at least, a reformation of those crying evils in this county.

Happily my wishes met the ideas of the other gentlemen acting in the commission of the peace here; and to their great honour, by their unanimous concurrence and assistance, I have been able to get erected a new Bridewell and Penitentiary-House at Wymondham, built upon such a plan as enables the Governor to keep the sexes and degrees of offenders entirely separate from each other, and under such regulations and discipline, as promise (with God's blessing) to work a thorough reformation in their manners, whereby they may, and many probably will, again become useful members of society. The house is constructed agreeably to the directions of the late act of parliament, and so contrived, that there are separate cells for each prisoner, airy, neat, and healthy, in which they sleep, and, when necessary, work the whole day alone. This solitude is found to affect the most unfeeling and hardened among them beyond fetters or stripes; and is that part of their punishment from which reformation is chiefly expected. Their cells are all arched, so that no fire can reach beyond the cell in which it begins. The rules and orders for the government of the house were, at the desire of the Justices at their Quarter Sessions, drawn up from, and according to the directions of the said act, by myself, and have met with their approbation.

Lord

Lord *Loughborough*, who came this circuit at our last assizes, expressed himself so well pleased with the plan and regulations, that he told me he would send thither every convict sentenced to confinement, and accordingly sent six from the assizes. As this attention to the lives and morals of those unhappy members of society should be extended, I will by the first opportunity (if you desire it) send you a copy of the rules and orders of the house, together with the returns constantly made by the governor to each quarter-sessions, by which you will see effected, what Mr. HOWARD despaired of, viz. "that the prisoners' earnings in the house have uniformly exceeded the sum expended for their maintenance." I wish and hope this example may excite a like attention in other counties.

I am, &c.

Hetbel-Hall, Norfolk,
Dec. 21, 1784.

THO. BEEVOR.

L E T T E R II.

SIR,

Hetbel, Jan. 20, 1785.

I Herewith transmit you a copy of the rules, orders, and regulations, to be observed and enforced at the house of correction at Wymondham; and which are also now extended to the other
Q3 houses

houses of correction in this county. If they appear severe, let it be understood they are the severities of the *legislature*, not of the compiler. The first seven rules are inserted verbatim from the schedule to the act of the 22d of his present Majesty. The rest are either included in the body of the same act, or required by the act of the 19th, called *The Penitentiary Act*. But I will make no apology for them, nor can I with any propriety deem them too harsh, since they have met with the entire approbation of the gentlemen of this county, as well as that of the judges of the assize, who have perused them.

Prisons surely should be places of real punishment, and even carry terror in their name. I am certain they ought not to afford either indulgencies or amusements to the persons consigned to them. However I must observe, that persons committed for small offences, or on light suspicion, are under less restraint. They are allowed to work in some sort of society, two, three, or four together; and if the house be full, they sometimes lodge two in a cell, and are never fettered. All the prisoners, when sick, are attended by a surgeon or apothecary, with as much assiduity and tenderness as the greatest humanity can require.

I have

I have sent you likewise a table of the prisoners' fare or diet in the house, by which you will see, that although not *pampered*, they are *wholsomely* fed. Experience justifies me in saying this; for, except such as were diseased when they entered the house, I have not known one prisoner who has been sick in it for these twelve months past. Included is also the form of a return made by the keeper of the house, to every quarter-sessions of the peace, whereby the state of the prison is constantly known to the justices, and all abuses obviated or speedily remedied. I am, &c.

THOMAS BEEVOR.

Rules, Orders, and Regulations, to be observed and enforced at the Houses of Correction in the county of Norfolk.

I. THAT the several persons committed to the houses of correction, to be kept to hard labour, shall be employed (unless prevented by ill health) every day (except Sundays, Christmas-day, and Good-Friday) for so many hours as the day-light in the different seasons of the year will admit, not exceeding twelve hours, being allowed to rest half an hour at breakfast, an hour at dinner, and half an hour at supper, and that the intervals shall be noticed by the ringing of a bell.

II. That the governor of each house of correction shall adapt the various employment directed by the justices, at their quarter-sessions, to each person, in such manner as shall be best suited to his or her strength and ability, regard being had to age and sex.

III. That the males and females shall be employed, and shall eat and be lodged, in separate apartments, and shall have no intercourse or communication with each other.

IV. That

IV. That every person so committed shall be sustained with bread, and any coarse, but wholesome food, and water; but persons under the care of the physician, surgeon, or apothecary, shall have such food and liquor as he shall direct.

V. That the governor, and such other persons (if any) employed by the justices to assist the governor, shall be very watchful and attentive in seeing that the persons so committed are constantly employed, during the hours of work; and if any person should be found remiss or negligent in performing what is required to be done by such person, to the best of his or her power and ability, or shall wilfully waste, spoil, or damage, the goods committed to his or her care, the governor shall punish every such person in the manner hereafter directed.

VI. That if any person so committed, shall refuse to obey the orders given by the governor, or shall be guilty of profane cursing or swearing, or of any indecent behaviour or expression, or of any assault, quarrel, or abusive words, to or with any other person, he or she shall be punished for the same in the manner hereafter directed.

VII. That the governor shall have power to punish the several offenders, for the offences herein before described, by closer confinement, and shall enter in a book (to be kept by him for the inspection of the justices at the quarter-sessions, and the visiting justice or justices) the name of every person who shall be so punished, expressing the offence, and the duration of the punishment inflicted.

VIII. That the governor shall prevent all communication between the persons committed upon charges of felony, or convicted of any theft or larceny, and the other prisoners.

IX. That the governor shall employ in some work or labour (which is not severe) all such prisoners as are kept and maintained by the county, though by the warrant of commitment such prisoner was not ordered to be kept to hard labour; and he shall keep a separate account of the work done by prisoners of this description, and shall pay half of the nett profits to them on their discharge, and not before.

X. That neither the governor, nor any one under him, shall sell any thing used in the house, nor have any benefit or advantage whatsoever, directly or indirectly, from the sale of any thing, under the penalty of ten pounds and dismission from his employment; neither shall he suffer any wine, ale, spirituous or other liquors, to be brought into the house, unless for a *medical* purpose, by a written order from the surgeon or apothecary usually attending there.

XI. That clean straw to lodge upon, shall be allowed to each prisoner weekly, or oftner if necessary; and that the prisoners be obliged to sweep out and clean their rooms every day, and the dirt and dust be conveyed out of the prison daily.

XII. That no person, without permission of a visiting justice, shall go into the lodging-rooms, or see or converse with any prisoner committed upon a charge of felony, or convicted of any theft or larceny; and all the prisoners shall every night in the year be locked up, and all lights extinguished, at or before the hour of nine, and shall, during rest, be kept entirely separate, if rooms sufficient can be found for that purpose; and during their labour as much separate as their employment will admit of.

XIII. That the governor may put handcuffs or fetters upon any prisoner who is refractory, or shews a disposition to break out of prison, but he shall give notice thereof to one of the visiting justices, within 48 hours after the prisoner shall be so fettered, and he shall not continue such fettering longer than six days, without an order in writing from one of the visiting justices.

XIV. That every prisoner be obliged to wash his face and hands once, at least, every day, before his bread be given to him.

XV. That each prisoner be allowed a clean shirt once in a week.

XVI. That the three prohibitory clauses of the 24th Geo. II. chap. 40, be painted on a board, and hung up in some conspicuous part of the prison, together with a printed copy of these rules, orders and regulations.

A Table of Diet.

	BREAKFAST.	DINNER.
<i>Sunday,</i>	A Penny Loaf	Hanway's Soups of Ox cheek, &c
<i>Monday,</i>	Ditto	A penny loaf
<i>Tuesday,</i>	Ditto	Potatoes
<i>Wednesday,</i>	Ditto	Boiled pease
<i>Thursday,</i>	Ditto	A penny loaf
<i>Friday,</i>	Ditto	Potatoes
<i>Saturday,</i>	Ditto	Boiled pease.

L E T T E R III.
Description of the Prison.

SIR,

Hethel, Feb. 20, 1786.

In compliance with your request, I now transmit to you a description of the prison which has been erected at Wymondham, in this county; the success of which having so much exceeded the expectations, and so fully answered the wishes, of the gentlemen here, as to encourage them to alter, and make additions to all the other bridewells within their jurisdiction, and to put each of them under the same regulations.

The new buildings of the Wymondham bridewell, added to the former old house, (which is now appropriated to the use of the governor) consist of two wings, which are attached to the old house,
and

and joined by a building in front, containing a large room, in which is placed a mill for cutting log-wood, or any other wood for the use of dyers, and beating hemp; together with a stable, and store-rooms for lodging the materials used by the prisoners in their work. The whole of these buildings forms a quadrangle, inclosing an area or yard, of about eighty feet by seventy; in which some of the prisoners are allowed occasionally to take the air.

In the two wings only (to both which there is a passage from the governor's house) are the offenders confined; and in each of them, there are on the ground floor seven separate rooms, or cells, for the *men* prisoners, of fourteen feet eight inches by seven feet four inches, with a work-room of twenty feet six inches by ten feet.

On the floor above, which is chiefly used for the women and less dangerous prisoners, are, in each wing, four separate rooms or cells, of the same dimensions with those below; with a work-room to each wing, the same as on the ground floor; together with an infirmary of ten feet six inches by fourteen feet eight inches, and a scullery, closet, and necessary to each. The cells, both above and below, are all arched, to prevent the possibility of fire, or any probable communication of infectious disorders.

orders. They are all ten feet high ; and the windows of these rooms, looking into the quadrangle, and being grated inside and outside with iron, and seven feet high from the floor of the rooms, afford the prisoners no possibility of looking out, or having the least intercourse with any other person. The cells are airy, having only wooden shutters to the windows ; and by a slip or wicket in the doors, a thorough air is admitted, whereby they are always free from any ill scent. This is however with an exception to *one* cell on the upper floor in each wing, and to the infirmaries ; for the windows of these are glazed, and have casements to open occasionally ; being mostly kept for the use of women having infant children with them, and for the weak and convalescent prisoners. But as the construction of this building would little answer the purpose of its erection, without a correspondent management and conduct in the interior government of it, good care has been taken to enforce the rules, orders, and regulations established ; and returns are regularly made by the governor to the justices at every quarter-sessions.

The manufactory established here at present is, that of cutting logwood for the dyers at Norwich, and beating, heckling, and spinning hemp. In the labour of heckling, a tolerable workman will
earn

earn from eight to ten shillings per week. The women and girls spin it by a wheel so contrived as to draw a thread with each hand; by which means, *two* of them can earn at least equal wages with *three* women spinning with one hand only. If the building should be enlarged, and the number of prisoners increase, some of them will then be instructed in the art of weaving the yarn made in the house. At present, both the tow and the yarn are sold to the different houses of industry established in this county, and at Norwich. In the last return of the governor to the quarter-sessions, we had the satisfaction to find, that the money arising from the earnings of the prisoners, was one pound eight shillings and ten-pence more than *double* the sum expended for their maintenance.

This, though it cannot be deemed more than a *secondary* consideration, is surely no trifling one to derive a *profit* from the labour of such persons as were heretofore lost to, or become a burden upon the publick; and it strongly marks the impolicy of sending these unhappy objects out of the kingdom. This sum indeed was further increased about five guineas, by adding to it the profit from the trade account; but as to have this become the general result, must depend greatly, perhaps chiefly, upon the choice of the governor, and somewhat on the
activity

activity of the magistrates, too much care cannot be taken in the former, especially as it will be the probable means of exciting the latter. We have been so fortunate as to meet with a governor, who relieves us from a great part of our attention to, and direction of him.

The silence and peaceable demeanour, the cleanliness and industry, of those unhappy persons who are the inhabitants of this house, are really admirable; and such as greatly encourage the pleasing expectation, that their punishment will have that effect upon their future lives and conduct, which every humane, benevolent mind must sincerely wish for. And they leave *me* without a doubt, that bridewells, with proper attention paid to them, may in future be made seminaries of industry and reformation, instead of receptacles of idleness and corruption. To effect these purposes, it will be necessary to provide the prisoners with suitable and constant work. This in most counties will necessarily vary, but may be easily obtained, especially if, by an allowance to the governor out of their earnings, it be made his *interest* as well as his *duty* to look carefully to the performance of it. The allowance given at this house, is *three-pence* in every shilling of the *nett* earning, and this is considered as a part of his salary.

I must

I must not omit to inform you, that in this solitary confinement, and thus employed, it has not yet been found necessary to punish any of the prisoners with irons; and that, since the new erection and regulation of this prison, the magistrates in the vicinity, as well as the keeper of it, have observed, that in no one equal period of time have there been so few commitments to it.

This *preventive* justice, so preferable to *punitive* justice, most fully evinces the propriety and humanity of the undertaking, and must naturally excite a hope, that similar plans will be adopted in every county. This indeed I am strongly induced to believe will soon be the case, as I have already received letters from different gentlemen in Gloucestershire, Oxfordshire, Wilts, Hertfordshire, Hampshire, Yorkshire, Lancashire, Suffolk, Wales, and Scotland, requesting the plan, rules, orders, table of diet, and returns; informing me, that in their respective counties they had determined upon building, and putting their houses of correction under similar regulations.

The gentlemen of the city of Norwich have also sent a deputation of their magistrates to view the prison; upon whose report, they mean instantly to enter upon a reformation of their own prisons.

If

If in this letter I may appear to have been either prolix, or frivolous, but should notwithstanding have been able to convey any useful hints to the publick, I shall be satisfied in having sacrificed the reputation of ability at the shrine of duty, and with pleasure subscribe myself, &c.

THOMAS BEEVOR.

[N. B. In another letter dated Feb. 18th, Sir THOMAS BEEVOR has added the following remarks:

“In proof of the cleanliness and healthiness of this prison, no person who entered it in health has hitherto fallen sick in it. I have never had any complaint against any one for immorality or prophaneness. The effect of the solitariness, and mechanical regularity of the place, is such, as to render them so contrite and subdued, that it not only promises fair for a lasting reformation in these poor unfortunate wretches, but, what is a still better and more pleasing consideration, that it may prove a preventive of crimes in others. For, from an examination of the commitments to this house, before, and since the present regulation took place, it appears, that one-third fewer have been confined in it since the latter period; and it is somewhat remarkable, that, except in one instance, no prisoner has been a second time committed to it.”]



ARTICLE XXIX.

On setting Wheat.

[In a Letter to the Secretary.]

SIR,

YOU tell me, in your last letter, that some gentlemen of your Society still doubt whether the practice of *setting* wheat becomes more general in Norfolk; and that their doubts arise from an apprehension that, on a large scale, a sufficient number of hands could not be procured to do it.

In reply to those gentlemen, I can not only say in general, that regular and profitable employment *always creates workmen*, but that in *this* particular labour, in which *women* as well as men can and *do* dibble, and *children* chiefly drop the grain, we have not yet met with any difficulty on that head; and that the practice increases much in this neighbourhood, as I believe it likewise does in most parts of the county.

At the same time candour obliges me to observe, that my habitation is in a very populous part of the country, where a scarcity of labourers is rarely known; yet I think the profit gained by the wheat-setters is such, that, in almost every situation, it will draw people enough to that employment.

For instance, the price frequently given (although I never pay more than eight shillings) is ten shillings per acre.* This in good weather may be done by one dibbler, attended by three droppers, in two days. This is five shillings per day, of which, if the dibbler gives to the children sixpence each, he will have himself 3s. 6d. for his day's work, which is much more than he can possibly earn by any other labour so easy to himself. But put the case, that the man has a wife who dabbles with him, and two or three of his own children to drop to him, you see his gains will then be prodigious, and enough to insure a plenty of candidates for that work, even in the least populous parts of the country.

When I say the practice of *setting* wheat in this county is become more general, I would not be understood that it is practised to the entire exclusion of sowing broadcast. Improvements in agriculture are slow in their progression. Since the first introduction of turnips, and I believe it also of clover, the culture of them did not for many years extend from the places of their first trial more than in the proportion of one mile in a year. The *setting* wheat you know is of a modern date; and this last season was late in consequence of the backwardness

* Although it is now done for six shillings an acre, the labourers earnings, from their expertness in the business, is very nearly, if not quite, equal to what is here stated.

of the harvest; it was also very wet and cold, which prevented many people from *setting* the quantity they had proposed; and obliged them, at the latter end of seed time, to sow broadcast on that account.

As I have no wish to support any system, I would not attempt to recommend any practice which did not appear to me a beneficial one. Wheat-setting certainly is so, especially when corn is dear, and if the season be favourable, may be practised with great benefit to the farmer.

On clover and grass leys, and ground not free from weeds, it is attended with peculiar advantages, from the wheat being deposited in the middle of the flag, free from the grass and weeds which spring from the edges, and frequently envelope and choke it, and also from such of them as would spring up and flourish, were the flag broken and torn in pieces by the harrows.

From my own experience, I find the produce is two bushels per acre more than from the wheat which is sown; but having much less small corn intermixed with it, the sample is better, and always fetches a higher price, to the amount generally of *two shillings* per quarter. Add to this, the great support given to the poor by this *second* harvest (as I may call it) which enables them to discharge their

rents, and maintain their families,* without having recourse to the parish; and I think the benefit must be obvious to every person.

I am, &c.

Hethel-Hall, Norfolk,

THO. BEEVOR.

Jan. 29, 1785.

ARTICLE XXX.

References to the annexed Plate of a patent Drill-Machine, invented by the Rev. JAMES COOKE, of Heaton-Norris, near Manchester;† and of a new-constructed simple Hand-Hoe.

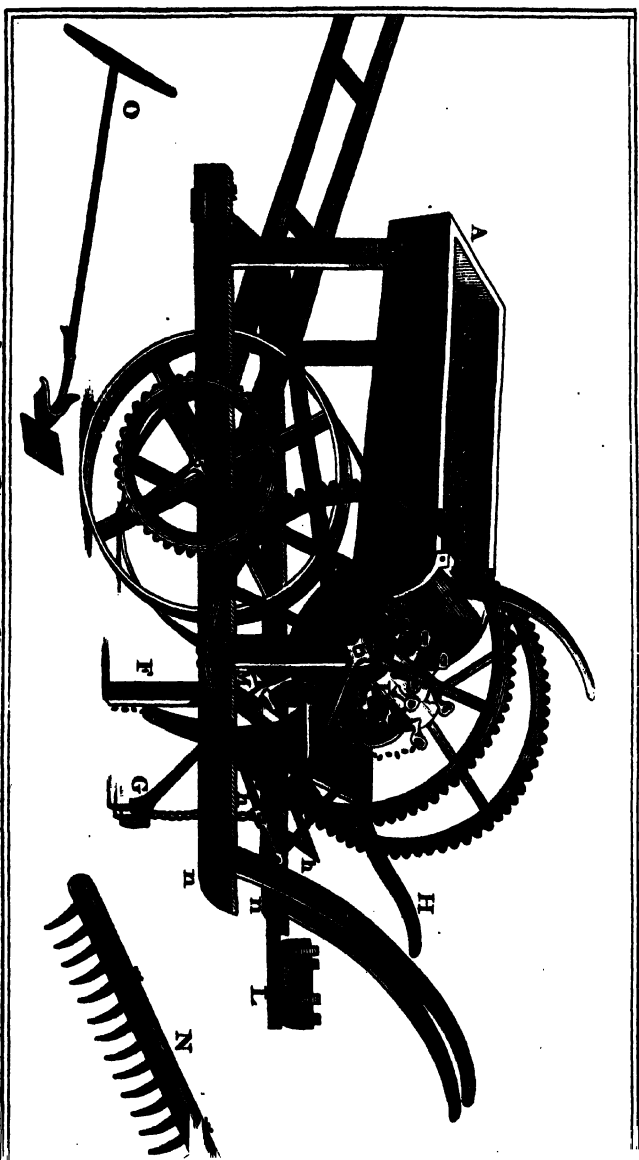
A, the upper part of the seed-box.

B, the lower part of the same box.

C, a moveable partition, with a lever, by which the grain or seed is let fall at pleasure from the upper to the lower part of the seed-box, from whence it is taken up by cups or ladles applied to the cylinder D, and dropped into the funnel E, and conveyed thereby into the furrow or drill, made in the land by the coulter F, and covered by the rake or harrow G.

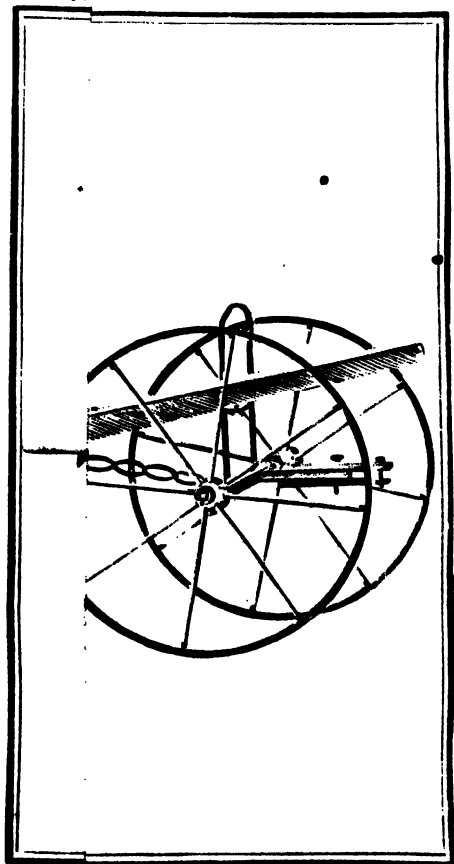
* Exclusive of the advantage farmers would reap from adopting a practice so fully and decisively proved to be right, we cannot but strongly recommend this consideration to their notice. In many parts of the West, where the poor are numerous, and employment not plentiful, the sowing of wheat would be of infinite service both to them and the farmers.

† Now at No. 73, Oxford-street, London.



Cookes' Patent Drill Machine.

Pl. 1



H, a lever, by which the wheel I is lifted out of gear with the wheel K, to prevent the grain or seed being scattered upon the ground, while the machine is turning round at the end of the land, by which the harrow G is also lifted from the ground at the same time, and by the same motion, by means of the crank, and the horizontal lever *h h*.

L, a sliding lever, with a weight upon it, by means of which, the depth of the furrows or drills, and consequently the depth that the grain or seed will be deposited in the land, may be easily ascertained.

M, a screw in the coulter-beam, by turning *o* which, the seed-box B is elevated or depressed, in order to prevent the grain or seed being crushed or bruised by the revolution of the cups or ladles.

N, a rake with iron teeth, to be applied to the under-side of the rails of the machine, with staples and screw nuts at *n n*, by which many useful purposes are answered; viz. in accumulating cutch or hay into rows, and as a scarificator for young crops of wheat in the spring, or to be used upon a fallow; in which case, the seed-box, the ladle cylinder, the coulters, the funnels, and harrows, are all taken away.

O, is a new-constructed simple Hand-Hoe, by which one man will effectually hoe two chain acres per day, earthing up the soil at the same time to the rows of corn or pulse, so as to cause roots to issue from the first joint of the stem, above the surface of the land, which otherwise would never have existed.

This side view of the machine is represented, for the sake of perspicuity, with one seed-box only, one coulter, one funnel, one harrow, &c. whereas a complete machine is furnished with five coulters, five harrows, seven funnels, a seed-box in eight partitions, &c. with ladles, of different sizes, for different sorts of grain and seeds.

These machines (with five coulters price sixteen guineas; with four coulters, fifteen guineas) equally excel in setting or planting all sorts of grain and seeds, even carrot seed, to exactness, after the rate of from eight to ten chain acres per day, with one man, a boy, and two horses. They deposit the grain or seed in any given quantity from one peck to three bushels per acre, regularly and uniformly, and that without grinding or bruising the seed, and at any given depth, from half an inch to half a dozen inches, in rows at the distance of twelve, sixteen, and twenty-four inches, or any other distance. They are equally useful on all lands, are durable, easy to manage, and by no means subject to be put out of repair.

Models may be seen at the White-Bear, Basinghall-street; at Mr. GATFIELD's, No. 54, Newgate-street, London; and at Mr. MATTHEWS's, Bath.

[N. B. If the patentee makes good his assertion the approaching season, "that this kingdom will be benefited by the above system of agriculture, supposing it in general use, from twenty to thirty millions sterling per annum," it must appear self-evident to every one, that this nation will stand in need of no other resource!]

Directions

Directions for using the Machine.

The ladle cylinder D (see the plate) is furnished with cups or ladles of four different sizes for different sorts of grain or seeds, which may be distinguished by the numbers 1, 2, 3, 4.

No. 1, (the smallest size) is calculated for turnip-feed, clover-feed, cole-feed, rape, &c. and will sow something more than one pound per statute acre.

No. 2, for wheat, rye, hemp, flax,* &c. and will sow something more than one bushel per acre.

No. 3, for barley; and will sow one bushel and a half per acre.

No. 4, for beans, oats, pease, vetches, &c. and will sow two bushels per acre.

Notwithstanding the above specified quantities of grain or seeds, a greater or less quantity of each may be sown at pleasure, by stopping up with a little clay, or by adding a few ladles to each respective box. The grain or seed intended to be sown, must be put in those boxes, to which the cups or ladles as above described respectively belong, an equal quantity into each box, and all the other boxes empty. The ladle cylinder may be reversed, or turned end for end at pleasure, for different sorts of grain, &c.

For sowing beans, oats, pease, &c. with a five-coulter machine, four large ladles must occasionally be applied at equal distances round those parts of the cylinder which
subtend

subtend the two end boxes. And for sowing barley, eight large ones must be applied as above; or four ladles, No. 2, to each of the wheat boxes. These additional ladles are fixed on the cylinder with nails, or taken off in a few minutes; but for sowing with a four-coulter machine, the above alterations are not necessary.

The funnels are applied to their respective places by corresponding numbers. Care should be taken, that the points of the funnels stand directly behind the backs of the coulters, which is done by wedges being applied to one side or other of the coulters, at the time they are fixed in their respective places.

The machine being thus put together, [see the plate] which is readily and expeditiously done, as no separate part will coincide with any other but that to which it respectively belongs, and an equal quantity of grain or seed in each of the respective boxes, the land also being previously ploughed and harrowed once or so in a place to level the surface; but if the land be very rough, a roller will best answer that purpose, whenever the land is dry enough to admit of it; and upon strong clay, a spiked roller is sometimes necessary to reduce the size of the large dry clods; which being done, the driver should walk down the furrow or edge of the land, and having hold of the last horse's head with his hand, he will readily keep him in such a direction, as will bring the outside coulter of the machine within three or four inches of the edge of the land or ridge, at which uniform extent, he should keep his arm till he comes to the end of the land; where having turned round, he must come to the other side of his horses, and walking

walking upon the last outside drill, having hold of the horses head with his hand as before, he will readily keep the machine in such a direction, as will strike the succeeding drill at such a distance from the last outside one, or that he walks upon, as the coulter are distant from each other.

The person that attends the machine should put down the lever H, soon enough at the end of the land, that the cups or ladles may have time to fill, before he begins to sow; and at the end of the land, he must apply his right hand to the middle of the rail between the handles, by which he will keep the coulter in the ground, while he is lifting up the lever H with his left hand, to prevent the grain being scattered upon the headland, while the machine is turning round; this he will do with great ease, by continuing his right hand upon the rail between the handles, and applying his left arm under the left handle, in order to lift the coulter out of the ground, while the machine is turning round.

If there be any difficulty in using the machine, it consists in driving it straight. As to the person that attends the machine, he cannot possibly commit any errors, except such as are wilful, particularly as he sees at one view the whole process of the business, viz. that the coulter make the drills of a proper depth; that the funnels continue open to convey the grain or seed into the drills; that the rakes or harrows cover the grain sufficiently; and when seed is wanting in the lower boxes B, which he cannot avoid seeing, he readily supplies them from the upper boxes A, by applying his hand, as the machine goes along,

to

to the lever C. The lower boxes B, should not be suffered to become empty before they are supplied with seed, but should be kept nearly full, or within an inch or so of the edge of the box.

If chalk lines are made across the backs of the coulter, at such a distance from the ends as the seed should be deposited in the ground, (viz. about two inches for wheat, and from two to three for spring corn) the person that attends the machine will be better able to ascertain the depth the seed should be deposited in the drills, by observing, as the machine goes along, whether the chalk lines are above or below the surface of the land; if above, a proper weight must be applied to the lever L, which will force the coulters into the ground; if below, the lever L and weight must be reversed, which will prevent their sinking too deep.

Wheat that is brined and limed should be made dry by spreading it thin upon a floor, and the loose particles of lime sifted out, before it is sown by the machine, otherwise the grain, by clogging together, will not be so regularly distributed in the drills. Good old seed-wheat is much better than new, and is not so subject to smut; this is proved by experience.

Upon wet soils or strong clays, wheat should not be deposited more than two inches deep, on any account whatever; nor less than two inches deep on dry soils. From two to three inches is a medium depth for all spring corn. But the exact depth at which grain should be deposited in
different

different soils, from the lightest sand to the strongest clay, is readily ascertained only by observing at what distance, under the surface of the land, the secondary or coronal roots are formed in the spring.

In different parts of the kingdom, lands or ridges are of different sizes; where the machine is too wide for the land, one or more funnels may occasionally be stopped with a little loose paper, and the seed received into such funnel returned at the end of the land, or sooner if required, into the upper seed-box. But for regularity and expedition, lands consisting of so many feet wide from outside to outside, as the machine contains coulters, when fixed at twelve inches distance, or twice or three times the number, &c. are best calculated for the machine. In wet soils or strong clays, lands or ridges of the width of the machine, and in dry soils, of twice the width, are recommended. For sowing of narrow high-ridged lands, the outside coulters should be let down, and the middle ones raised, so that the points of the coulters may form the same curve, that the land or ridge forms. And the loose soil harrowed down into the furrows should be returned to the edges of the lands or ridges, from whence it came, by a double mould-board, or other plough, whether the land be wet or dry.

Clover or other lays, intended to be sown by the machine, should be ploughed a deep strong furrow, and well harrowed, in order to level the surface, and to get as much loose soil as possible for the coulters to work in; and when sown, if any of the seed appears in the drills uncovered, by reason of the stiff texture of the soil, or toughness

toughness of the roots, a light harrow may be taken over the land, once in a place, which will effectually cover the seed, without displacing it at all in the drills. For sowing clays, a considerable weight must be applied to the lever L, to force the coulters into the ground; and a set of wrought-iron coulters, well steeled, and made sharp at the front edge and bottom, are recommended; they will pervade the soil more readily, consequently require less draught, and expedite business more than adequate to the additional expence.

For every half acre of land intended to be sown by the machine with the seed of that very valuable root, (carrot) one bushel of saw-duft, and one pound of carrot seed, should be provided; the saw-duft should be made dry, and sifted to take out all the lumps and chips, and divided into eight equal parts or heaps; the carrot-feed should likewise be dried, and well rubbed between the hands, to take off the beards, so that it will separate readily, and being divided into eight equal parts or heaps, one part of the carrot-feed must be well mixed with one part of the saw-duft, and so on, till all the parts of carrot-feed and saw-duft are well mixed and incorporated together, in which state it may be sown very regularly in drills at twelve inches distance, by the cups or ladles, No. 2. Carrot-feed resembling saw-duft very much in its size, roughness, weight, adhesion, &c. will remain mixed as above during the sowing; a ladle full of saw-duft will, upon an average, contain three or four carrot-seeds, by which means the carrot-feed cannot be otherwise than regular in the drills. In attempting to deposit small seeds near the surface, it may so happen that some of the seeds may not be covered
with

with foil; in which case, a light roller may be drawn over the land, after the seed is sown, which will not only cover the seeds, but will also, by levelling the surface, prepare the land for an earlier hoeing than could otherwise have taken place.

It has always been found troublesome, sometimes impracticable, to sow any kind of grain or seed (even broadcast) in a high wind. This inconvenience is entirely obviated, by placing a screen of any kind of cloth, or a sack, supported by two uprights nailed to the sides of the machine, behind the funnels, which will prevent the grain or seed being blown out of its direction in falling from the ladles into the funnels. Small pipes of tin may also be put on to the ends of the funnels, to convey the grain or seed so near the surface of the land, that the highest wind shall not be able to interrupt its descent into the drills.

That farmers may not be reduced to the necessity of sowing their land out of condition, that is, when the soil is wet and clammy, every exertion ought to be made, in ploughing up their lands ready to sow as early as possible in the season, that the first opportunity of sowing when the land is dry may be embraced; nothing bids fairer for success in the drill system, than early sowing; in which case the plants have time to throw out or multiply so many additional stems or offsets as the land is able to support. But if farmers will sow early, they must plough early, otherwise strong productive soils will not be in condition to receive the seed; and such extraordinary advantages have been uniformly derived from ploughing up stubbles immediately after the crops have been carried, that many
intelligent,

intelligent, experimental farmers have declared, that one furrow of the plough before winter is worth two or three in the spring.

Respecting the use of the machine, it is frequently remarked, by some people not conversant with the properties of matter and motion, that the soil will close after the coulters, before the seed is admitted into the drills. Whereas the very contrary is the case; for the velocity of the coulters, in passing through the soil, is so much greater than the velocity with which the soil closes up the drills by its own spontaneous gravity, that the incisions or drills will be constantly open for three or four inches behind the coulters; by which means it is morally impossible (if the points of the funnels stand directly behind the coulters) that the seed, with the velocity it acquires in falling through the funnels, shall not be admitted into the drills.

Directions for Hoeing, &c.

THIS hoe [see the plate] is worked much in the same manner as a common Dutch hoe, or scuffle, is worked in gardens; the handle is elevated or depressed, to suit the size of the person that works it, by means of an iron wedge being respectively applied to the upper or under side of the handle that goes into the socket of the hoe.

Wheat and rye cannot be hoed too early in the spring, provided the soil be dry enough to admit of being previously rolled with a light roller; nothing facilitates and expedites hoeing for the first time so much as rolling, by pulverizing the soil and levelling the surface; it ought nevertheless to be omitted, rather than used, if the soil be not quite dry, at least dry enough to quit the roller.

The

The wings or moulding plates of the hoe, which are calculated to earth up the soil to the rows of corn, so as to cause the roots to issue from the first joint of the stem above the surface, which otherwise would not have existed, should never be used for the first hoeing, but should always be used for the last hoeing, and used or not used, at the option of the farmer, when any intermediate hoeing is performed. The last hoeing or earthing up should not take place till the crop is eight or ten inches high; or till the young ears of corn are so far advanced in the stems, as to be above the surface of the soil, when the earthing up is finished. The young ears of corn will, on dissecting a few stems, be found to exist in embryo as it were, much sooner than is generally apprehended. ~~The absurdity~~ of rolling any crop after the young ears are formed, and of earthing up the soil, before they are advanced in the stems above the surface of the soil, must be self-evident. In the former instance they will be crushed by the roller; in the latter, they will be smothered by the soil. The young ears of corn will be found to exist, as soon as the secondary or coronal roots are formed.

The above observations on hoeing wheat and rye, are applicable to the hoeing of all spring crops; only the first hoeing of barley, oats, &c. should take place as soon as the second blade or leaf of the young plant appears; and of beans, pease, &c. as soon as the plants can be distinguished in the rows.

The best season for hoeing is two or three days after rain, or so soon after rain as the soil will quit the instrument in hoeing. Light dry soils may be hoed almost at
any

any time, but this is far from being the case with strong clay soils; the season for hoeing such is frequently short and precarious; every opportunity therefore should be carefully watched, and eagerly embraced. The two extremes of wet and dry are great enemies of vegetation in strong clay soils; the bad effects of the former, though difficult to guard against, are nevertheless to be remedied in some measure by ploughs of a better construction, and more properly conducted, than such as are commonly met with in strong clay soils. For if the wing or feather of the plough-share were made nearly as wide as the intended furrow, and fixed so as to move parallel to the surface of the land, the under side of every furrow would be cut parallel to the surface, and a smooth floor or surface polished by the bottom of the plough would be found under every furrow, forming a regular plane with an uniform descent from the top of a ridge into the water-furrow; upon which polished floor or surface, all superfluous water, after filtrating through the loose soil, or furrows turned over by the plough, would find its way readily and precipitately into the water furrow, at least so as to prevent its stagnating in the soil, so as to starve the plants. But so far from guarding as much as possible against the bad effects of superfluous water stagnating in clay soils, by the above palpable process in ploughing, the construction of the ploughs commonly made use of, and the method of conducting them in strong clays in several parts of this kingdom, have a direct tendency to the contrary; this is done by working their ploughs in such a position, that the wing or feather of the share, being neither so wide as the intended furrow, nor parallel to the surface when at work, but forming an angle of forty or fifty degrees with the
same

same, or, in other words, moving in an oblique-direction to the surface, turns over not a square or parallel, but a triangular furrow. In which case it is self-evident, that such lands are only half-ploughed; there being so many ridges of fast undisturbed soil, as there are furrows, forming so many troughs or trenches; that of all the superfluous water that shall fall upon such lands, so much only as shall remain over and above filling the trenches will be able to find its way into the water-furrows; for some clay soils, indeed all soils when puddled, will hold water-like a dish; consequently so much water as the above trenches shall contain, will remain there till it is evaporated by sun and air, starving the plants, and puddling the soil to such a degree, that the nutritive quality in the food of plants may become so far impaired as not to be restored; or if it should, the tender fibres of the roots of plants may be so putrified by stagnated water as to be incapable ever after of answering their intended purpose in promoting vegetation.

As to the bad effects of strong clay soils caking in dry weather, nothing more easy to prevent; for there is a period between the time of clay soils running together, so as to puddle by superfluous wet, and the time of their caking by drought, that they are as tractable as need be. Now this is the time, this is the juncture for hoeing; and so much land as shall be thus seasonably hoed, will not cake or crust upon the surface, as it otherwise would have done, till it has been soaked or drenched again with rain; in which case the hoeing is to be repeated, as soon as the soil will quit the instrument, and as often as necessary; by which time, the growing crop will begin to cover the

ground, so as to act as a screen to the surface of the land, against the intense heat of the sun, and thereby prevent, in great measure, the bad effects of the soil's caking in dry weather.

When land is to be laid down with seeds, the seeds must not be sown, as usual, with the grain, but the day the last hoeing is to be performed. If seeds are sown when barley is sown, hoeing is excluded, consequently the great advantages of drilling are frustrated; but not being sown till the last hoeing is just going to take place, every purpose is answered. For the crop is not only improved by hoeing, but the soil in the spaces between the rows of corn, being cleared from weeds, and pulverized by hoeing, will be in much better condition to receive the seeds; and the seeds being sown broadcast just before the last hoeing, will be incorporated with the soil by the action of the hoe, so as to vegetate much better, and produce a much better crop than usual. The wings or moulding plates of the hoe may, or may not be used at all upon land that is to lie down with seeds.

Such strong weeds as may grow directly in the rows of corn, and out of the reach of the hoe to cut up, should be plucked up by hand, to prevent their coming to maturity, and dropping their seeds upon the soil, that has been previously made clean by hoeing.



ARTICLE XXXI.

*Account of a Crop of Beans and Turnips in
alternate Rows.*

[By Mr. JOHN BULT, of Kingston, near Taunton.]

GENTLEMEN,

IN reply to your Secretary's enquiries relative to my drilled crop of beans, with turnips in the intervals, I send you the following particulars:—

The field measures six statute acres ~~and~~ a quarter, and is a good clayey soil.

The beans were planted in drills near two feet apart, on two ploughings, and horse-hoed three times, the turnips being sown in the intervals at the third or last hoeing. There has been no kind of manure or dressing laid on the land for six crops past, nor is there any need of it, as I find by experience, that drilling and horse-hoeing answer the end fully.*

The weight of turnips was 37 tons 5 cwt. per acre, as measured and weighed by Mr. PAVIER, and Mr. HEADFORD. These turnips are now feeding off. Thirty-one head of horned cattle, sixty-

The crop of beans was near three quarters per acre.

seven sheep, and twenty-six pigs, have been maintained wholly by them for a month past; and what remains will keep them at least a month longer. The whole expence of drawing and carting them into an adjacent field for the cattle, is between six and seven shillings per acre.

I am, &c.

Dec. 10, 1785.

JOHN BULT.

A further Account of this Crop.

[In a Letter to the Secretary.]

SIR,

Mr. JOHN BULT, of Kingston, called upon me on Wednesday last, requesting I would view the crop of turnips which you had written to him about.

Accordingly, (yesterday) I went to see it, and must confess it gave me great pleasure; therefore I beg leave to make a few remarks upon it. I was informed that this field (which contains little more than six acres) has been under a course of drill husbandry for five or six successive years, during which time it has had no manure or top-dressing. Beans were drilled upon it last spring, at less than two feet distance. They were horse-hoed thrice; and

and at the third hoeing, the turnips were sown promiscuously among them. This was about Midsummer; and from this time nothing has been done in the field but drawing the beans, and carrying them off the land.

The crop was believed to be considerably above twenty bushels per acre, which is much more than were produced by any other method in our neighbourhood the last season. This account I had before I went into the field; consequently, I did not expect to see any extraordinary ~~crops~~ turnips, where no trouble or expence (not even so much as to cover the seed) had been taken. However, I was much mistaken, and therefore was desirous of knowing the weight per acre. I accordingly marked out a perch, which, after a close examination, I thought to be a fair sample of the field. We had them drawn and weighed, the nett weight was 521 lbs. which I calculate to be upwards of 37 tons and 5 cwt. per acre.

When you consider that here was no crop lost, no preparation, dressing, nor any expence whatever, (except that of the seed, and sowing it) you will undoubtedly allow it to be a very profitable crop; and that it must be entirely owing to the cleanness of the ground by frequent hoeings. I

must confess, it appears to me one of the best recommendations of the drill husbandry that I have ever known or heard of.

Since I was at Mr. BULT's, I have had information of two other crops on a similar plan, only with this difference, that the turnips were sown among the beans at the *second* horse-hoeing. These crops of turnips are also very good; and the beans were more than *double* the value of those raised in the usual mode of husbandry. I think it is very evident, ~~that~~ the beans preserve the turnips from the fly; and as no expence or trouble attends this practice, I apprehend it will soon become more general.

Persuaded, however, I am, that it can never answer but where the ground is made very clean, by the crops for a few preceding years having been well horse-hoed. I also think the beans (which here are less than two feet apart) should have more room. The sun and air would be more freely admitted, and they would receive less damage from the operation of the hoe.

THOMAS PAVIER.

West-Monckton, Dec. 12, 1785.

[N. B.]

[N. B. The uncommon success of this experiment seems at least to militate against what we have said in the notes on Mr. ANDERDON's crop of beans and turnips; but the cases are by no means similar. Though the land in both instances is called a *heavy clay*, they are very different. Mr. A's is *poor, wet, and cold*. The other a *good, rich clay*, and, we apprehend, naturally mixed with a kind of *marle*, which is called clay by persons not thoroughly acquainted with the nice distinction of soils apparently alike, but very different in their nature. Our principle, therefore, that cold, wet, clay lands are unsuitable for turnips, remains unaffected by this* experiment; and general practice confirms the truth of the theory.]

A second Letter from Mr. Pavier, on the same Subject.

SIR,

BESIDES Mr. BULT's crop of drilled beans and turnips, (of which you have had already an account) there were last summer two other crops in the neighbourhood on the same plan, managed nearly alike with respect to the beans, and the beans of nearly equal value; viz. drilled in rows about twenty-two inches distance, twice horse-hoed, and the produce from about twenty-five to thirty bushels the computed acre, or (supposing the perch to be fifteen feet) from thirty to thirty-six bushels the statute acre. I must here observe, that the last summer was very unfavourable

unfavourable to the beans, and that the produce per acre in the common husbandry was not, on an average, in this neighbourhood, equal to a third part of the above quantity. From the best intelligence I have been able to obtain, one of these crops of turnips was considerably better than Mr. BULT's; they were sown in a field of nine computed acres on the 10th of June, after the second horse-hoeing; but whether the second hoeing was performed too soon, the ground not clean, or whatever else might be the cause, the beans were weeded by hand twice afterwards, and I suppose the turnips were somewhat benefited by it. A very intelligent farmer, who went to see the crop, who has lately done a little in the drill husbandry, and on whose veracity I can depend, has assured me that this was the best crop of turnips he ever beheld.

The turnip-feed in the other crop was put in by a hand-drill between the rows of beans; but the farmer being unused to a drill of that kind, the work was badly performed, the turnips being in some places vastly too thick, and altogether as much too thin in others; the farmer has told me himself, that where they happened to be of a proper size of thickness, it was one of the most profitable crops he ever had. This was on a very wet, heavy soil, not very favourable for turnips.

Though

Though here is no experiment fairly and accurately made, or properly related, I think the following conclusions may be justly drawn from the above facts:—

1st. That with respect to beans in particular, the drilling and horse-hoeing is vastly superior to the common mode of husbandry.*

2^{dly}. That the beans are undoubtedly a good preservative of the turnips from the depredations of the fly.† And,

3^{dly}. That as by this method no crop is lost, and consequently no rent, and but a mere trifle of expence (if any) chargeable to the turnip crop, it must be one of the most profitable, as well as the most certain method of propagating that useful root ever yet practised.

I might have procured some other instances of the advantages attending this method the last season on some smaller scales; but they would only have tended to corroborate the above conclusion respecting the fly, which I presume will obtain credit without further proofs, and induce some of your in-

* Of this there cannot be a doubt.

† This we much wish to see fully proved by decisive experiments made in different parts of turnip fields.

genious

genious correspondents to give it a fair trial, and report the consequences in a proper manner.

I shall only take the liberty to observe further, that if I had an opportunity of trying this method, I believe I should drill the beans in rows at a greater distance, in order that the turnips might be hand-hoed easily; that I should prefer the small London tick-bean to any other, by reason of their shortness, and being such great bearers; and that I should take off their tops as soon as the under blossoms begin to decay, which I am convinced would be of great service.

I'am, &c.

West-Monkton,

THOMAS PAVIER.

Feb. 11, 1786.

ARTICLE XXXII.

Experiment on drilling Horse-Beans.

[By GEORGE WINTER, esq.]

SIR,

MY attention for near seven years past has been employed on improvements in agriculture; and as under, I have extracted from my minute book, the particulars of the few acres I have
this

this year drilled with horse-beans, which (if the gentlemen will think it worthy their perusal) is much at their service.

The field (about seven acres) which produced the beans, was so barren, that I could not let it in the year 1783 for ten shillings an acre; the soil about four inches deep, on a very stiff clay, was about nine years past greatly impoverished by burning, and improper cultivation. By my mode of management, it produced me last year upwards of one hundred and eighty bushels of ~~excellent~~ cone wheat, nine gallon measure;* one hundred and forty of which I sold for seed at seven shillings and nine-pence per bushel; the remainder made very good bread for my family.

Time did not permit my ploughing up the ground, before the beginning of December last; and it was then done carelessly, in irregular ridges from four feet and half to six feet wide, as I intended it to have been again ploughed twice more in the spring. The severe frost frustrated my intentions; this field could not be cultivated before April. The surface was well pulverized by the frost, and on ploughing a single ridge, I found the under-stratum of too hard and consolidated a

* About 28 bushels and a half per acre Winchester measure.

texture to afford me the least expectation of success by further ploughings. As the season was so far advanced, I ventured in that condition (rather than lose the opportunity of a crop) to drill in horse-beans, two bushels to an acre, in the best manner I could, in rows twenty-seven inches distant, three inches deep, and three inches apart in the rows, with irregular intervals between those different size ridges; which drilling was performed in eight hours, on the 20th of April last. This was the first operation of my new machine, the cylinders ~~where~~ of being *then* made of wood, were injured by the hardness of the beans, consequently, by its continual friction, did not deliver the beans, at the last working, so regularly as I could have wished; nevertheless, my beans appeared, in a very short time, superior to any planted by hand in the neighbouring fields.

On the 26th and 27th of May, the whole field was hoed, with an instrument containing three triangular flat shares, fixed in a plank, with a short beam and wheel to render the working steady, and govern the depth, being about two inches; which cut the weeds, the three shares clearing the breadth of near two feet, being guided by handles, the same as a plough. The second hoeing was performed as before, on the 26th and 27th of June.

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It was after this worked with a small horse drag rake, three feet long and eighteen inches broad, with handles to guide it. The third hoeing was executed with a Norfolk plough, had of you; turning the loosened mould to the beans. I had the satisfaction to find my ground work well during the excessive dry season, and on examining other grounds managed in the common way, found my crop far superior, which can be proved by farmers of credit and reputation. I cannot as yet ascertain the produce, not having had them threshed, which should not be performed till near Christmas, it being necessary to let them remain in stack till about that time, before which they will not be sufficiently hardened.

In February last, I took the opportunity of about three days of mild weather, to plough up an old piece of ground about three acres; which, rather than let it lie a fallow, I likewise drilled with horse-beans as before. On the 28th of April, it was once horse and hand-hoed only; from the appearance of that crop, I apprehend I shall be a loser by it. But as it is now ploughing up for wheat, the ground appears in a much better state, than if it had had a compleat summer fallow. My other bean grounds that were horse-hoed, were last year intended for wheat, which the season did not permit
me

me to drill; as the ridges were from four to near five feet wide, I planted on a part, the 4th of April, Windfor beans, at six inches distance in single rows on a ridge. After being horse-hoed in May, the intervals were planted with potatoes, which were afterwards horse-hoed with the beans. My crop is not yet threshed, therefore cannot ascertain the produce, but it was allowed on inspection to be the best according to the season.

On other parts of the above grounds, I planted dwarf speckled kidney-beans, the latter end of May and beginning of June, at three inches distance in single rows, some between the broad beans, others between the four feet rows of potatoes; the latter were much injured by the potatoe haulm, which over-ran the kidney-beans; the former, having sufficient room between the broad beans, were well kidded, and have every appearance of being productive. From the length of their horizontal roots, and the space the branches occupied I am by experience convinced, they are more productive by being planted at six inches distance in the rows, than if planted nearer.

I have likewise experienced, that horse-beans at four inches distance, in single rows about two feet six to eight inches apart, are much more advantageous

vantageous than having any thing planted or sowed in the intervals, when the land is intended for a succeeding crop of wheat; as such intervals admit of frequent horse-hocings, by which the land afterwards requires only being formed into proper ridges for wheat.

My pea field, of about four acres, was broke up the 28th of November last; drilled, on one ploughing only, with two bushels of pease per acre, at the distance of twenty-seven inches between the rows; and was once horse-hoed on the 11th of June: the produce twelve bushels per acre. The soil was rather wet, six inches deep, on a stiff stony clay. When ploughed, it was full of cammacks and some ant-hills, and worked very rough; but by being well ploughed and dragged after the pease were off, has been brought to such a state as to admit of having wheat drilled in it.

All my little horse-hocings, amounting in the whole to about thirty-three or thirty-four acres, have been, according to my directions, well executed by WM. EDWARDS, a boy, and one horse, which performed four acres a day. The horse, not being accustomed to such work, induced me to employ a boy (who walked between the rows leading the horse) rather than run the risque of the horse's injuring the crops.

As my drilled Siberian wheat and barley are not yet threshed, I cannot ascertain the produce, but from appearances it is much better than any sowed in the common way.

The few drill-ploughs I have seen, have appeared to me to be very complex, which was my inducement for constructing the one I now use. Upwards of twelve months have been employed to bring it to its present state, which, in making frequent alterations, has already been extremely expensive. Its cylinders, *now*, are solid and lasting; and although (at present) it works well, drilling all my wheat on land that will permit, it must undergo another alteration to make it perfectly complete.

Under these circumstances, I am extremely sorry it is not yet in my power to comply with your request; but shall be able in a few months, after my wheat, &c. are all planted, to make it complete for inspection.

I am, Sir,

Your most obedient servant,

Charleton, Nov. 2, 1785.

GEO. WINTER.

ARTICLE XXXIII.

Instructions for raising of Potatoes.

[By Mr. JOSIAH HAZARD.]

GENTLEMEN,

A Premium having been offered by the Bath Agriculture Society, for the cultivation of potatoes by farmers, &c. whose rent does not exceed forty pounds per annum; and the increase of that valuable root being of great consequence to the poor, I flatter myself it will not be thought impertinent in me to give some instructions for the raising them to advantage.

As I shall point out various methods, it may be right to inform those who have only a small spot of ground, how they may obtain a plentiful crop.

First then, the earth should be dug twelve inches deep, if the soil will allow of it; after this, a hole should be opened about six inches deep, and horse-dung, or long litter, should be put therein about three inches thick; this hole should not be more than twelve inches in diameter; upon this dung, or litter, a potatoe should be planted whole, upon which a little more dung should be shaken, and then

earth must be put thereon. In like manner the whole plot of ground must be planted, taking care that each potatoe be at least sixteen inches apart; and when the young shoots make their appearance, they should have fresh mould drawn round them with a hoe; and if the tender shoots are covered, it will prevent the frost from injuring them; they should again be earthed when the shoots make a second appearance, but not be covered, as in all probability the season will then be less severe.

A plentiful supply of mould should be given them, and the person who performs this business should never tread upon the plant, or the hillock that is raised round it; as the lighter the earth is, the more room the potatoe will have to expand.

I obtained the last year from a single root thus planted very near forty pounds weight of large potatoes, and from almost every other root upon the same plot of ground, from fifteen to twenty pounds weight; and I will venture to assert, that, except the soil be stoney or gravelly, ten pounds or half a peck of potatoes may almost always be obtained from each root, by pursuing the foregoing method. But note, cuttings or small sets will not do for this purpose.

The second method will suit the indolent, or those who have not time to dig their ground, and that is, where weeds much abound and have not been cleared in the winter, a trench may be opened in a strait line the whole length of the ground, and about six inches deep; in this trench the potatoes should be planted about ten inches apart; cuttings or small potatoes will do for this method. When they are laid in the trench, the weeds that are on the surface may be pared off on each side about ten inches from it, and be turned upon the plants; another trench should then be dug, and the mould that comes out of it turned carefully on the weeds. It must not be forgot, that each trench should be regularly dug, that the potatoes may be throughout the plot ten or twelve inches from each other.

This slovenly method will in general raise more potatoes than can be produced by digging the ground twice, and dibbling in the plants; and the reason is, that the weeds lighten the soil, and give the roots room to expand. They should be twice hoed, and earthed up in rows. And here note, that if cut potatoes are to be planted, every cutting should have two eyes, for though fewer sets will be obtained, there will be a greater certainty of a crop, as one eye often fails, or is destroyed by grubs in the earth.

Where a crop of potatoes fails in part, (as will sometimes be the case in a dry season) amends may still be made by laying a little dung upon the knots of the straw or haulm of those potatoes that do appear, and covering them with mould; each knot or joint thus ordered will, if the weather prove wet afterwards, produce more potatoes than the original roots.

I have raised potatoes from the apples that grow on the haulm, but they were very small the first year, though I found them much increase in size, when they were planted again the second year; but I do not think they will ever answer any good purpose.

I obtained the last year from the smallest potatoes planted whole, from four to six pounds at a root, and some of the single potatoes weighed near two pounds. These were dug in as before mentioned, in trenches where the ground was covered with weeds, and the soil was a stiff loamy clay. I know these small potatoes are held in contempt for planting, by those whose prejudice will not suffer them to try experiments; but I can assure them, that they will upon trial fully answer their expectations; though I advise by no means to dibble in potatoes, as the person who uses the dibble treads
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the ground, and prevents the young fibres from properly expanding.

A good crop may be obtained by laying potatoes upon turf at about twelve or fourteen inches apart, and upon beds of about six feet wide, on each side of which a trench should be opened about three feet wide, and the turf that comes from thence should be laid with the grassy side downwards upon the potatoes; a spit of mould should next be taken from the trenches, and be spread over the turf, and in like manner the whole plot of ground that is designed to be planted must be treated. And remark, that when the young shoots appear, another spit of mould from the trenches should be strewed over the beds so as to cover the shoots; this will prevent the frost from injuring them, encourage them to expand, and totally destroy the young weeds; and when the potatoes are taken up in the autumn, a careful person may turn the earth again into the trenches, so as to make the surface level; and it will be right to remark, that from the same ground a better crop of potatoes may be obtained the following year.

For field planting, a good (if not the best) method is to dung the land, which should be once ploughed previous thereto; and when it is ploughed

a second time, a careful person should drop the potatoe plants before the plough in every third furrow at about eight or ten inches apart. Plants that are cut with two eyes are best for this purpose. My reason for planting them at so great a distance as every third furrow, is, that when the shoots appear, a horse-hoe may go upon the two vacant furrows to keep them clean; and after they are thus hoed, they should be moulded up in ridges; and if this crop be taken up about October or November, the land will be in excellent condition to receive a crop of wheat. Lands that are full of twitch or couch grass may be made clean by this method, as the horse-hoeing is as good as a summer fallow; and if, when the potatoes are taken up, women and children were to pick out such filth, not any traces of it would remain; and by laying it on heaps and burning it, a quantity of ashes would be produced for manure.

After ploughing, none should ever dibble in potatoes, as the persons who dibble, plant, or hoe them, will all tread the ground, by which means it will become so bound, that the young fibres cannot expand; nor did I ever hear, that from the dibbling method, more than fifty or sixty sacks were produced from one acre; whereas, by ploughing them in as before-directed, I have obtained more than one hundred sacks per acre.

Indeed, I have known good crops obtained by ploughing the land twice, and dropping the plants in every other furrow, and by hand-hoeing and earthing them up afterwards as the gardeners do pease; but this method is not equal to the other. Vacant places in hedge-rows might be grubbed and planted with potatoes, and a good crop might be expected, as the leaves of trees, thorns, &c. are a good manure, and will surprisingly encourage their growth, and gratify the wishes of the planter, who, by cultivating such places, will then make the most of his ground, and it will be in fine order to receive a crop of corn the following year.

I shall now conclude by noting, that gravelly, stony, chalky, or stiff clay land, will never produce many potatoes; and the few they do produce, will be cankered and only fit for pigs; it is therefore obvious, that such soils are improper.

If these few loose hints are worthy the acceptance of the Bath Agriculture Society, I am happy in having the honour of communicating them, and am, with great deference,

Their obedient servant,

JOSIAH HAZARD.

Stoney-Littleton, Feb. 18, 1786.

ARTICLE XXXIV.

On the Suffolk Breed of Cows; raising Potatoes, &c.

[In a Letter to the Secretary.]

SIR,

I Rejoice to learn from you, that your patriotic Society are preparing to print a third volume of their correspondence; the two former gave such general satisfaction, and were so truly useful to the publick, that every well-wisher to the prosperity of this country must earnestly wish a continuance of them.

In consequence of the great approbation you expressed of my breed of cows, when I had the pleasure of shewing you my farm last summer, I take the opportunity of mentioning some particulars relative to them, in what articles I think them preferable to the other breeds, with the mode of their treatment, and the usual profit of them. The cows you saw were bred from the polled or hornless Suffolk dun-coloured cows, (than which, for *profit*, though not for *beauty*, I think, with the most intelligent Mr. YOUNG, there is not so valuable a breed in England) by a Derbyshire black and white bull, given me by my friend Lord TOWNSHEND. This mixture produced their uncommon colour of mouse

mouse and white, as well as that shape and make which pleased you, and is so much esteemed by the best judges of cattle; their heads and necks being small, their legs short, carcases large and deep, and loins remarkably broad; and being of greater weight in seemingly less compass than any beasts I ever saw; whether, from being without horns, from being constantly kept in shedded yards or houses during the winter, from their nature, or from these causes altogether, they are so tame and docile, that I never knew any mischief done by them to any other animal. In the summer, for the sake of shade, and in the winter for shelter, they herd together in the manner of sheep; without offering the least injury to each other. They feed in the park in summer; and in winter, such of them as are not in full milk, are fed in the yards on barley or oat straw, and on the leaves and offal of the turnips, which are given to those which have more lately calved, and are kept in the house; those housed have therefore, you see, the roots, and best of the turnips or cabbages with straw, (for hay is never given here to cows.) Their average profit per annum, when a regular account of them was kept a few years since, was, after all charges deducted for keeping, and every fair article of expence, four pounds per cow; but as this profit will probably be found short of the profit of many other breeds

breeds, it should be mentioned, that the weight of these beasts on an average, as they are in milking, does not exceed thirty-six stone; some indeed are bigger, but others are not so large. For hardness, docility, and shape, I think there are few to compare to them. But to obtain, and preserve the last, in these, and every species of animal, there should be an uniform and constant attention paid to the rearing always the best and prime of the stock, and getting rid of every other. That, and that alone, will, I believe, go near to ensure a good, valuable, and handsome stock of every kind.

You will not be sorry, perhaps, to know what was the produce of some of the different kinds of the potatoes you saw growing in my experiment field; I will therefore inform you, that the white Champain (of which you saw about two acres) produced me at the rate of three hundred and forty-six bushels per acre. That another kind, procured me by a friend from Manchester, (of which I had sufficient to plant six rods, or perches of land) produced at the rate of six hundred and forty-eight bushels per acre; and that the sort given me by our ingenious friend Mr. RIGBY, who received them from Liverpool, and which had been only two or three years before raised *from seed*, were planted on one, and the ninth part of a rod or perch

perch of land; and produced at the rate of one thousand and eighty bushels per acre. The Champaign were fit for use sooner than the two other kinds, by about six weeks; but were neither so large, nor numerous upon the roots. All these kinds were dry, mealy, and well-flavoured, scarcely differing from each other in taste. They were all cultivated by the plough, in the same field, in the same manner, and at the same time; the difference of the produce is prodigious, owing, I conceive, in some measure, to their having been longer, or more lately raised from the seed; this observation has, I know, been made by others: but be it as it may, I will propagate the last sort upon as large a scale as my stock of them will permit; and if I find them continue as productive as in the last year, I will be sure to communicate the stock to you, if you wish to have it. I have chiefly applied them to the feeding of hogs. When boiled, and given to fattening swine, I have not found them answer alone; but mixed with an equal part of barley, or buck-meal, I have had them equally fat, and in as short a time, as those which were fed with either of the meals alone. Given raw, they are admirable for store swine, or cows, or bullocks. Our poor people are now so fond of them, and find such support from them, that they are very generally cultivated by them for some miles round this place.

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It is much to be wished they were universally encouraged. The different houses of industry in this county having now adopted the use of them.

The turnip-rooted cabbages you saw, are in great perfection, but reserved until the latter part of the spring, when no other green vegetable can be had. The cabbages were used during the last snow, and weighed most of them, after the loss of all their outward leaves, upwards of a stone each.

I am, with the sincerest good wishes,

Your obedient humble servant,

THOMAS BEEVOR.

Helibel, Norfolk, Jan. 28, 1786.

ARTICLE XXXV.

On River Weeds as a Manure.

GENTLEMEN,

AMONGST the variety of manures that have been recommended to give a stimulus to the vegetative principle in land, I do not recollect the weeds of rivers to have been mentioned by any writer on agriculture. Sea weeds have been found,
by

by long and repeated practice, to be very efficacious in promoting vegetation; especially when reduced to putridity by mixing them in compost with lime and earth. But these can only be locally applied. The interior parts of the kingdom receive no advantage from them; but river weeds might be collected, and applied with equal, if not superior, advantage in almost every parish.

Being situated by a river, I had frequently regretted the quantity of weeds impeding the stream, and being the occasion of many little islands forming, which frequently in very rainy seasons caused floods and inundations, destructive of convenience, and sometimes of life. To prevent this in some measure, it is usual for the weeds in common unnavigable rivers, to be cut twice in the summer months. In this practice, the occupiers of mills and of meadows are interested; the *latter* from the fear of inundations on the suddenness of heavy rains; the *former* peculiarly so to open the current, and admit the water below to pass away freely. But little care is taken to disincumber the stream, unless in some places to draw them out on the banks, where they are suffered to remain as a nuisance, without any useful or profitable application. Having frequently observed this, I determined to try their effect as a manure in their green state. I therefore

therefore tried them on some garden ground, and they appeared to answer my expectation. But as this small experiment was not fully decisive, I prevailed on a neighbouring farmer to try them on one acre in a large turnip field then preparing, and on that acre entirely to omit any of the compost with which the rest of the field was manured. This he exactly conformed to, and threw the water weeds into every furrow that was at the next turn filled up by the plough. The consequence was, that by the moisture and fermentation of the weeds, the seeds vegetated much sooner than on the rest of the field. They also grew quicker, and were superior both in the size of the roots and luxuriance of the leaves, so as to render the spot very conspicuous in the field.

But impartiality obliges me to remark, that in the succeeding crop, (barley) there was a perceivable inferiority to the rest of the land. Whether this proceeded from the weeds or some other cause, I cannot determine; but the success of this trial (with respect to the turnips) being decisively in its favour, induced me, in the following summer, to collect a considerable quantity of these weeds, and to lay them by the side of a common reservoir of dung, but not to incorporate them with any part of it; and when the mass was removed, it did not
appear

appear to have imbibed any of the manure. This I laid on some land of my own, similar to that on which the former experiment was made. It was ploughed in the latter end of October the same year on a pease stubble, and wheat *set* by hand upon it. The whole field was a good crop, and the part on which the weeds were laid not at all inferior to the rest, on which stable-dung had been spread in the usual mode of the Norfolk husbandry. Though this experiment was made as unmixed as possible, with a view to ascertain the vegetative virtue resulting from the weeds singly, (and proved it by the crop being equal to those parts of the field which had been dunged) yet I conceive, it would act with additional energy when mixed in compost with other manures. It would probably quicken their operation, and derive from them a permanency which seems most likely to result from an union of animal and vegetable salts and oils. That they succeeded without mixture on a light sandy soil in the turnip crop experiment, is evident; and as the time of their first cutting, is that of sowing turnips, it gives opportunity for thus applying them with little trouble or expence.

I am, &c.

JOHN WAGSTAFFE.

Norwich, Feb. 4, 1784.

ARTICLE

ARTICLE XXXVI.

*On the Culture of Buck-Wheat; Wheat, and Potatoes,
alternately; and the uses of Buck-Wheat.*

[In a Letter to the Secretary.]

SIR,

I AM not only at all times well inclined to forward the views of your patriotick establishment, but I consider the flattering testimony of the Society's approbation, which I lately received for raising a crop of buck-wheat, to have imposed on me a particular obligation to communicate the best information in my power, respecting the cultivation of that vegetable; and this I undertake with the more readiness, from a conviction of its great utility, and that it deserves the attention of every tillage farmer.

It was in 1780 that I began this culture. About seven acres of a sandy soil on Brislington common,* having been first tolerably well cleansed from brambles, furze, &c. received one ploughing. To reduce the irregularities of the surface, it was rolled; and on the 9th of June in that year, two bushels and a half of buck-wheat per acre sown, the ground rolled again without harrowing.

A very rough piece of land, at that time just inclosed.

The

The vegetation appeared in five or six days, as is constantly the case be the weather wet or dry. The growth was so rapid, that the fern, with which this land greatly abounded, was completely kept under. About the middle of September the crop was mown, but, by reason of a great deal of rain about that time, it was not secured until the beginning of October; hence a loss of great part of the grain by shedding, as well as some eaten by birds. However, there were saved about twenty-four Winchester bushels per acre, which, notwithstanding its long exposure to the weather, received no sort of damage, only perhaps, that the finest and most perfect grain was the first to fall from the plant. The ground after this had almost the appearance of a fallow, and was immediately ploughed.

When it had lain a moderate time to meliorate, and to receive the influences of the atmosphere, it was harrowed, sown with Lammas wheat, and ploughed in under furrow, in a contrary direction to the first ploughing. Thus a piece of land, which in the month of April was altogether in a state of nature, in the following November was seen under a promising crop of what is well stiled the king of grain, and this without the aid of manure, or of any very great degree of tillage. Nor was the harvest by any means deficient; for several persons

conversant in such things estimated the produce from twenty-six to thirty bushels per acre; I had not then the precaution to register the exact measure. As soon as the wheat crop was taken off, the ground had one ploughing, and on the 1st of September following was sown with turnip-feed. The turnips were not large, but of an herbage so abundant, as in the following spring to support one hundred and twenty ewes with their lambs, which were fed on it by folding four weeks. After this it was manured with a composition of rotten dung and natural earth, about twenty putt loads per acre, and planted with potatoes. The crop sold for one hundred and thirty-eight pounds, besides a considerable number used in the family, and a quantity reserved with which ten acres were planted the following season. The ensuing autumn it was again sown with wheat, and produced an excellent crop. In the spring of 1784, it was manured and planted with potatoes, as in the preceding instance; the crop (though tolerably good) by no means equal to the former, producing about one hundred sacks per acre only.

This land is now for the third time under a crop of wheat, it being my intention to try how far this mode of alternate cropping, one year with potatoes, and another with wheat, may be carried.

From

From the success of the preceding experiment on buck-wheat, as also of that for which I was honoured with the Society's premium, and various others which I have made for several years past, it is become with me a favourite object of cultivation; being clearly of opinion, that it ought in numerous cases to supersede the practice of summer fallowing; for the crop produced seems not only to be so much clear gain in respect to such practice, but also affords a considerable quantity of straw for fodder and manure; beside that I think a summer fallowing is nothing like so advantageous a preparation for a succeeding crop. From its quick and luxuriant vegetation, it is an admirable destroyer of weeds, and suits with a dry, light, mellow soil, but flourishes most in a light sand. It is impatient of wet and cold.

The proper season for sowing I take to be from the middle of May to the middle of June.* I have sown it however so early as the beginning of April, and so late as the 22d of July, by way of experiment, but have found the latter extreme rather to be chosen. In another experiment, a small piece of land brought to maturity the grain of two different crops in the summer of 1783.

* The last week of May, or the beginning of June, is still better; as the least frost will cut off the plants at their first appearance, it being a native of a much warmer climate.

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The use to which I have hitherto applied the grain hath been mostly in feeding hogs, for which I esteem it equal in value to barley; it is much more easily and conveniently ground than barley, as a malt-mill will grind it completely. Horses are very fond of the grain, and poultry of all sorts are speedily fattened by it. Probably it may hereafter be found a material article in distillation, should a sufficient quantity be raised with that view. After spring feeding, a crop of cole-seed, turnip-rooted cabbage, or vetches, there will be sufficient time to sow the land with buck-wheat. Probably, a crop of vetches might be mown for hay early enough to produce a crop of this grain after it.*

The blossom of the plant affords food for bees at a very opportune season of the year, when the meadows and trees are mostly stripped of their flowers. As far as conjecture reaches, I have seen a greater number of bees labouring at once upon my buck-wheat flowers, than could possibly belong to all the hives in our parish; and to one fond of rural amusements, the scene is truly delightful. The English term *buck-wheat*, seems to be a corruption. I am rather inclined to think it ought to be *beech-wheat*, from its likeness in shape and colour to the beech mast, also from its classical name

* Only in hot dry summers.

fagopyrum. I have likewise seen it termed beech-wheat in an English treatise on husbandry, written in the reign of Henry VIII.

I rely upon the candour of the Society to excuse inaccuracies, and such remarks as may seem foreign and unimportant. If any of my observations should be thought to merit consideration, it will be matter of abundant gratification to

Your most obedient servant,

NEHEMIAH BARTLEY.

Bristol, Feb. 8, 1785.

ARTICLE XXXVII.

On the Necessity of Hoeing Turnips.

Addressed to the Farmers in the West of England.

[By ARTHUR YOUNG, esq.]

NOTHING sounds so wonderful to East-country farmers as hearing of the conduct of their brethren in the West, who do not hoe their turnip crops. Long and universal practice has given the East-country farmer the most complete conviction, not of the propriety only, but of the absolute necessity of this operation.

Without hoeing, we should get a produce on our best lands of, perhaps, two, three, or at most four tons on an acre, and that chiefly leaf. With hoeing, we get from twenty to thirty-five tons of root only; and if leaf were an object, much more than is ever gained without. The difference in the mere quantity of the crops, therefore, would alone be an argument powerful enough to be persuasive to men who will give their understandings any play; but there are other circumstances not less important, that ought to be taken into consideration.

The hoeing not only thins the turnips, and makes them large, but it destroys all weeds that may have risen in the field from the last ploughing; a second hoeing repeats this; and in favourable seasons a third may be given; so that one great object (the greatest in my opinion) of summer fallowing, that of killing weeds, is better answered than it can be by ploughing. Whoever will coolly consider this point, cannot fail to admit the great efficacy of this improved husbandry.

I must still view this object in yet another light, Summer fallowing is attended in various cases with a very bad effect. There is reason to believe, that the action of the sun-beams impoverishes land
when

when in tillage. It volatilizes and exhales those finer particles, on which depend, or with which is connected, the food of plants; but where husbandry is very ill understood, and the farmers have no correct ideas of the due arrangement of crops, this evil is properly submitted to, in order to effect the destruction of weeds by ploughing. How valuable then is the turnip culture, which by means of hoeing destroys the weeds, and at the same time covers the land from the action of the sun, in those months which are oftentimes the hottest in the year!

If the land be well tilled and pulverized, I am inclined to think, that many weeds may rather be propagated than killed by the turnip husbandry without hoeing; for if the ploughings be given in a quick succession, the roots and seeds will be tumbled about too fast for vegetation, and when the land is sown and left to repose, they will grow very fast; and if no hoeing follow, the successive crops will, by their weedy appearance, shew that little benefit is derived from this very imperfect management.

That the right conduct is to hoe, cannot be doubted; but the question is, how to enforce it? Your excellent Society of true and genuine patriots have done much in almost every branch of husbandry;

dry; nor has this object been neglected by them. But probably, the best means of disseminating the practice, will be found that of importing a few good hoers from Suffolk, [the best part of the county for such a purpose is the angle between Woodbridge and Orford] and to give premiums for all the hands they instruct, and to all that are instructed by them; with an honorary reward to that gentleman who shall import one or more for the same purpose. Perhaps this subject deserves a further attention previous to the next season.

ARTHUR YOUNG.

ARTICLE XXXVIII.

*On the Essex mode of cultivating and applying Potatoes,
Carrots, Winter Vetches, &c. &c.*

[In a Letter to the Secretary.]

SIR,

YOU have no reason to apologize for requesting of me the leisure of a few hours on agricultural subjects, as I should esteem many days most usefully employed, that could in any degree further the views of the Bath Agriculture Society; who appear to me to form an antidote to the dangerous

gerous allurements of the spot where they assemble, and to have erected the temple of industry in the vale of pleasure. May they prevail on the votaries of the one, to prepare for its relaxations, and double its enjoyments, by being first initiated in the trials and mysteries of the other; and thus to learn, that a taste for rational employment is the essential preparative for rendering amusements just in their pursuit, and innocent in their effects! Without this, such amusements must in their end, if not their aim, (however harmless they may appear) be merely a vicious dissipation.

Potatoes, (of which you propose some queries to me) I have tried only on a very trifling scale, among the intervals (for the first two years) of a little plantation. By working the soil, their vegetation encouraged that of the young trees, and the produce amply paid for every attention to the ground.

In this county, within about twelve miles of London, they are now extensively cultivated; but in what mode, or succession of crops, I know not.

For *small* pork, when baked or boiled, mixed with a little barley-meal, we have found them excellent; but for *large hogs*, they are most profitably given raw, if these have at the same time the shack
of

of the barn-door in threshing season, or occasionally a few beans; and may thus be brought forward at a cheaper-rate, for—what, we think, will alone make large meat and firm bacon—pease and barley-meal.

We have tried them in bread: it was excellent, but the loss of weight in the baking, and the time and delicacy of the process, rendered this, as it indeed does most of these things, far from eligible æconomy for the poor.*

I take the liberty of mentioning what we found, to our very great satisfaction, in a newspaper, that potatoes should be dressed in an iron pot, over a slow fire, without any other water than what the fire will gradually extract from the root itself. By this mode, they are far more dry, mellow, and rich, than when any other water is added to them. But this is a proof of their being a very cold food raw.

However valuable from ease of culture, and greatness of produce, to the poor especially, in all small spots; I doubt, unless near large towns, whether, on a *farming* plan, potatoes be so eligible as other herbage or roots, especially as carrots, which I cannot but *surmise* (for my trials are too trivial to

* The most æconomical use of potatoes both for rich and poor, is to eat them plain boiled. For cattle, they will do raw; but for hogs, boiling is preferable.

venture bolder language) deserving every encouragement, even on soils hitherto thought too heavy for them.

Our prodigality in the number of horses kept, and the mode of keeping them, renders some substitute for oats essential. From the price oats must on that account ever bear, from the superior quality of their straw as winter food for cattle, and from there being less delicacy required in the cultivation of the soil for their produce, they are rendered *as valuable* to the farmer as a crop of barley; and consequently the export of the latter, even when *manufactured* into malt, is impeded and impaired, by what, comparatively, ought to be regarded as an unprofitable grain. Let our export of other grain be therefore what it will, a very heavy deduction on this *most national profit*, must now be made by the importation of oats, or we must stop this drain, by substituting them in cultivation for barley at home. A desperate alternative!

In this part of Essex, on a whole year's fallow after wheat, barley is generally sown; and by the produce of at least one quarter more in quantity, (on a medium five quarters per acre) and its superior quality, it is supposed to pay for the omission of any hocking crop that might have preceded it.

But

But this very land, which requires such delicate and expensive process for barley, will, without the fallow, (with the admission of beans, pease, or turnips) produce an *equal* quantity of oats. For the two last years, three parts of my field for oats were thus *perfectly* fallowed after wheat, and the other part cultivated with cabbages and turnips for winter provender; and in both trials, agreeably to what a very considerable farmer had assured me, my crop of oats (a grain not requiring that nice pulverization of the soil, so essential to barley in the sowing tilth) was in quantity and quality, after each of the crops of winter herbage, fully equal to the returns of the *expensive* fallow. The consequence to me is, that as from motives of convenience I never sow barley, I shall yet probably exceed in my profit my neighbours that do, as I can avoid that *complete fallow* by substituting oats; to which they must necessarily submit.

I am from experience convinced, that an acre of carrots will double in the quantum, of equally hearty provender, the product of an acre of oats; and from the nature of their vegetation, the nice mode of cultivation, and even of taking them up, (all of which, expensive as they are, bear a very inferior proportion to the value of a medium crop) must leave the land, especially if taken off it in an early period,

period, so mellow for the plough, as to form a seed-bed for barley, equal to any fallow tilth.

I apprehend too, the land *proper* for barley, immediately *after a vegetable crop*, is well suited to the produce of carrots. If this apprehension be well founded, (and surely, even on conjecture, in a *small scale* it merits a general trial on soils *tolerably light*) the horses in such places might, for the winter half year, be maintained for the strongest work without oats, and the soil assigned to that crop be thus amply prepared for the more mercantile one of barley.

I mention only horses, because for them a substitute is chiefly wanted. For other cattle, we have a variety of winter vegetables, but none (as far as my small trials extend) that wear the soil so little, prepare it for the following crop so well, and are so nutritive and sweet in their effects, as carrots. The few that I have this year, and which (as they sustained but little injury from the frost of last year) will probably remain in the ground till it is necessary to plough it up for oats, were, from the drought of last spring, so imperfect a plant, that, after strong harrowing, I sowed over them a crop of turnips, and have now in *this mode* a better piece of this herbage, with the additional chance of the carrots, than most of my neighbours.

As the little arable land I cultivate is chiefly subservient to the pasturage of a few cattle, I have been rather whimsical in my attempts at the best for winter and spring, but have always found that it requires a much sounder land than ours chiefly is, to venture in any extensive degree at winter grazing. Cabbages in such a spot, as being planted on ridges, and wanting a stronger soil, seem preferable to turnips; but on an enquiry lately among the great dairy-farms of the heavy part of Suffolk, I found the culture of cabbages had declined, from some experience of the deficiency in the succeeding crop of barley.*

For early spring feed, I know nothing so certain, and so little expensive (which with us, winter tares, a most excellent pasturage, *are not*) as ryegrass, sown as clover with oats or barley; the usual objections to this grass appear to me to be entirely obviated, by sowing it *extremely* thick, not less than a bushel and half or two bushels per acre, which renders it proportionably fine; and feeding it as *early* and as *constantly* as possible; by this management the turf turns in at the next autumn for wheat, as richly as the usual clover-ley; and has with me produced as good crops of corn.

* This will be the case when leguminous crops are not *fed off* the land, which cabbages cannot be.

I last year tried, instead of the common, the perennial red clover, called cow-grass, (*trifolium alpestre*) the seed from it was most luxuriant, and the butter excellent; in autumn it was turned in for wheat, of which there is on it (at present) the finest plant. If this grass be nearly equal to the common clover in produce, without danger like that to cattle in its effects, far superior in the flavour of its juices, and not an inferior bed for a crop of wheat, it merits very general attention. For my necessities, it is not *sufficiently early*; on this very account, I again last spring sowed rye-grass, with 5lb. per acre of burnet with my oats, for the early feed of the ensuing spring; and have not suffered it to be *at all fed* in autumn. The grass has grown very well since harvest, and will, I apprehend, so bear the winter, as to be sufficiently early: but the burnet is probably so impeded by it, as to appear very thin and weak, and (considering the price of its seed) does not appear to answer my purpose; unless the field were to continue in grass for at least two years, when the burnet might have time to spread into a very early piece of spring pasturage, and fully answer its expence.

I have twice after wheat tried a little brank or buck-wheat; though my land is not light enough for it, it is extremely convenient; since not being
sown

sown till May at the soonest, the land may leisurely be fully fallowed, and seems so little to foul or wear it,* that when off in October, it may be ridged up at once into a winter fallow, for barley in the spring.† All poultry, and hogs when running about, thrive upon it, and even stall'd oxen; and horses, when mixed half with oats. The straw is tolerable provender for the cow-yard.

I am, respectfully your's,

C. ONLEY.

Stisted-Hall, Essex, Jan. 5, 1786.

ARTICLE XXXIX.

On Steeping Seed-Barley in a Dry Season.

[In a Letter to the Secretary.]

SIR,

MY great success in making the following experiment, occasions my communicating an account of it to you, for the benefit of the publick, if thought worthy a place in the third volume of the Bath Society's experimental papers.

The last spring being remarkably dry, I soaked my seed-barley in the black water taken from a re-

On the contrary, it will clean it more than any thing except turnips. † Or immediately sown with wheat.

fervoir

servoir which constantly receives the draining of my dung-heap and stables. As the light corn floated on the top, I skimmed it off, and let the rest stand twenty-four hours. On taking it from the water, I mixed the seed grain with a sufficient quantity of sifted wood ashes, to make it spread regularly, and sowed three fields with it. I began sowing the 16th, and finished the 23d of April. The produce was sixty bushels per acre, of good clean barley, without any *small* or *green* corn, or weeds at harvest. No person in this country had better grain.

I sowed also several other fields with the same seed dry, and without any preparation; but the crop, like those of my neighbours, was very poor; not more than twenty bushels per acre, and much mixed with *green* corn and weeds when harvested. I also sowed some of the seed dry on one ridge in each of my former fields, but the produce was very poor in comparison of the other parts of the field.

I am, &c.

JAMES CHAPPLE.

Edmin, March 12, 1784.

[We consider this experiment as a very interesting one, and recommend general trials to be made both in wet and dry, spring seasons.]

ARTICLE XL. *On the Culture of Potatoes.*

[By Mr. JOSEPH WEBB.]

GENTLEMEN,

AS the diffusion of useful information amongst mankind in agriculture, is evidently the end and design in the institution of your laudable Society at Bath, I beg leave, through your permission, to lay before the publick, in your next publication, the method I have made use of for near twelve years in the selecting proper potatoes for seed; during which time I have never lost a crop, or any part thereof worth mentioning, by what is called the curled or blighted potatoe.

Several of your correspondents seem to think, that the fault is in the nature of the soil in which they are planted; but from this, I believe, I may with the greatest confidence dissent, at least it has not been so in my practice, and, I believe, I have had as great a share thereof as most men; for during the late war, I usually planted between twenty and thirty acres, and sometimes many more in a year.

About eighteen years ago, I took a large garden near Portsmouth; at that time potatoes were not
much

much used in these parts, and their culture much less understood. I believe, I planted more than all the other gardeners at that time in this island: I set of the same sort of potatoes that I found on the premises from year to year, for five or six years; but to my great loss and surprise, I generally lost half, and sometimes nearly all my crop, by their being blighted, or infected with what is called the curled disease.

I then changed my seed for some which grew at or near Torbay; the first year they did very well. I planted of the produce of this seed the next year, and recommended the same to some of my friends at Southampton, Winchester, Hambledon, and Chichester, thinking it was very good; but to our great disappointment, we lost the greatest part of our crops, although at so considerable a distance, and I believe very different soils: from whence I infer the fault is not in the land, but in the seed.

I was forced hereby to try a different method, and soon after Christmas made a hot-bed in the following manner:—(which method I have used ever since) I laid horse-dung, &c. (as is generally used in making hot-beds) about eighteen inches thick, over which I spread a layer of fine rich mould about four or five inches thick; upon the

top of this mould I laid, in different divisions, a certain number of potatoes of various sorts, some of my own growth, and others bought from different parts, and covered these lightly over with more mould; they soon came up. I then observed which was freest from the blight or curl; for if there were not more than one defective in *forty* or *fifty*, I concluded I might set of that sort with safety. This method I have now practised near twelve years, and never lost my crop or any part thereof worth mentioning, whilst my neighbours, who followed the old method, were frequently disappointed in their crops; and to the best of my knowledge, all those of my neighbours who have of late been persuaded to take the trouble of using the same means as myself, have never failed of success to their utmost wishes in one instance; nor do I ever think it will fail, if duly attended to; the fault being some hidden cause in the seed unknown at present, and I believe incurable by any means, at least that have yet come to my knowledge.

My reason for planting my hot-beds so soon is, that if the frost hinders the first experiment, or they all prove bad, I may have time to make a second or third if necessary, with different sorts of seed, before the proper season arrives for planting in the fields and grounds appointed for the great and

and general crop. Wishing you success in your laudable undertaking, I remain,

Gentlemen,

Your obedient servant,

JOSEPH WEBB.

Portsea, Hants, Jan. 18, 1785.

ARTICLE XLI.

A new Method of shortening the Operation of Churning described and recommended.

SIR,

MY ears having of late been often serenaded with the monotonous musick of the butter-churn from morning till night, I have endeavoured to find out some contrivance for accelerating that operation, so particularly tedious at this season of the year; and I have the satisfaction to inform you, that my endeavours have not been unsuccessful.

I recollected to have heard when a boy, that a bit of soap slipt into the churn, would effectually plague the dairy-maid, by preventing the cream from ever producing butter. Whether this effect would follow, I never had the mischievous inclina-

tion to try. However, I took it for granted, and imputed it to the alkaline salt contained in the composition of the soap. Hence I conceived, that some chemical preparation of an opposite quality might produce as opposite an effect. I could think of nothing so likely to answer this purpose, and at the same time so innocent, as the *vegetable acetous acid*. Accordingly, when the next operation of churning had been going forward for half the day, I caused a little distilled vinegar to be poured into the churn, and the butter was produced within an hour afterwards. It has since been regularly made use of for this purpose, and always with the desired success.

If the supposition be admitted, that the cream of *old* milk (and such is milk for the most part at this season) contains much stronger alkaline salt, or at least more of it than *new* milk does, then the effect of the vinegar is readily accounted for on the known principles of chemistry. It is an acknowledged property of *alkalies* to unite with oil into a saponaceous mass, and to render them intimately miscible with water. But it is likewise well known to chemists, that there is a nearer affinity, (as they term it) a much stronger elective attraction between *acids* and *alkalies*, than between alkalies and *oils*. Consequently, the acid, being mixed
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with the cream, immediately attaches to itself the *alkaline salt*, which is the bond of union, as we may call it, that holds together the *oleaginous* and *aqueous* particles, and leaves them easily separable from each other.

It may perhaps be objected to this mode of practice, that the acid mixing with the cream would render the butter unpalatable; but this on experience I do not find to be the case; and indeed I should not myself have suspected it; as the butter is usually well washed in two or three changes of clean water, by which the whole of the acid is carried off; or if some few particles remain, they are *so few* as not to be perceived by the taste, and perhaps have rather a desirable effect than otherwise, by acting as an antiseptic, and preventing the butter from becoming rancid so soon as it otherwise would do.

Whether it may be beneath the dignity of your institution to pay any regard to a communication of so trifling a nature, I will not presume to determine. But I apprehend you will agree with me, that by a strict attention to the minutiae of rural œconomics, the farmer will be the better enabled to pay his rent, and to live comfortably. By the accumulation of *pence*, the *pound* is acquired. And
I have

I have reason to think, the farmer would find himself some *pence* the richer in the course of a year, by attending to this information; at least, I am confident it would shorten the labour of many a weary arm, and prevent much vexation to a multitude of good housewives.

My experiments have not as yet ascertained the exact quantity of the acid which is necessary to produce the proper effect, nor the precise time of its being mixed with the cream. But I apprehend, a table spoonful or two to a gallon of cream will be sufficient; nor would I recommend it to be applied till the cream has undergone some considerable agitation.

Jan. 9, 1784.

RUSTICUS.

ARTICLE XLII.

An Account of an Experiment in the Cultivation of Buck-Wheat, [Fagopyrum] made at Brislington.

[By NEHEMIAH BARTLEY, esq.]

GENTLEMEN,

BETWEEN the 14th and the 21st of June 1783, I ploughed a piece of land on Brislington common, containing about twelve acres. It
was

was harrowed in the direction of the plough. Two bushels per acre were then sown, and a roller was run over it. Nine acres of this ground is a reddish sandy loam; the other three acres a wet clay, which, for want of draining, was somewhat poachy. The former produced a most luxuriant herbage, which effectually got the mastery of every kind of weeds; even the quick-shooting fern could not keep pace with it.

The remaining three acres of clay failed very much; there not being on the whole so much herbage as on a single acre of the other. The crop was harvested the beginning of September; and produced upwards of twenty waggon loads of straw, and only two hundred and thirty bushels and half of grain, nearly twenty bushels per acre.

Between the 8th and the 22d of October following, the same ground was sown with red lammas wheat, two bushels to an acre. It had one ploughing, after which the grain was eared in; the ridges dressed or righted, by closing the furrows, and trimming up the loose earth.

In that part of the land where the buck-wheat had failed, the wheat failed also; and that as exactly as it is possible to imagine. The produce of this
crop

crop was two hundred and eighty-three Winchester bushels and half.* Some years preceding this experiment, (which was made chiefly to further the views of the Bath Agricultural Society) I have been in the culture of buck-wheat, and have tried it in various soils, and at various times of sowing, from the beginning of April to the 22d of July. The result of my observations is, that the cultivation of this grain is well worth the husbandman's attention; that it delights in a mellow sandy soil; and succeeds well in any dry, loose, healthy land, and moderately so in a free loamy stone-brash. A stiff clay is its aversion, and it is entirely labour lost to sow it in wet poachy ground.

The most proper time for sowing it, I find to be from the middle of May to the middle of June. I would choose rather to sow it even in the beginning of July, than before the middle of May; for it is very impatient of cold in its first vegetation.

A crop of buck-wheat is, in my opinion, so much clear gain to the farmer, seeing that the land is thereby so well prepared for a succeeding crop, even better than by a fallow; besides that it affords a noble resource for raising manure,

I am, &c.

NEHEMIAH BARTLEY.

Bristolington, Feb. 10, 1785.

* Not quite twenty-four bushels per acre.

ARTICLE XLIII.

*Directions for preserving Threshed Wheat from Weevils
and other Insects, while lodged in Granaries.*

GENTLEMEN,

THE preservation of grain from the ravages of insects, is an object of no inconsiderable consequence to the farmer and corn-merchant,

It may, I believe, be best effected by timely and frequent screening, and ventilation; as little or no inconvenience will follow corn or malt lodged dry, but what evidently results from a neglect of these precautions. For, whether the obvious damage arise from the weevil, the moth, or the beetle, that damage has ceased at the time the vermin make their appearance under either of these species; they being, when in this last state of existence, only propagators of their respective kinds of vermiculi; which, while they continue in that form, do the mischief.

In this last, or insect state, they eat little, their principal business being to deposit their *ova*, (eggs) which unerring instinct prompts them to do where large collections of grain furnish food for their successors while in a vermicular state. It is therefore
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the business of industry to prevent future generations of these ravagers, by destroying the eggs previous to their hatching; and this is best accomplished by frequent screening and exposure to draughts of wind or fresh air. By frequently stirring the grain, the cohesion of their ova is broken, and the nidus of those minute worms is destroyed, which on hatching collect together, and spin or weave numerous nests of a cobweb-like substance for their security. To these nests they attach, by an infinity of small threads, many grains of corn together, first for their protection, and then for their food. When their habitations are broken and separated by the screen, they fall through its small interstices, and may be easily removed from the granary with the dust. Those that escape an early screening will be destroyed by subsequent ones, while the grain is but little injured; and the corn will acquire thereby a superior purity. But by inattention to this, and sometimes by receiving grain already infected into the granary, these vermin, particularly the weevils, will in a short time spread themselves in that state every where on its surface, and darken even the walls by their number. Under such circumstances a hen or hens, with new-hatched chicken, if turned on the heap, will traverse without feeding (or very sparingly so) on the corn, wherever they spread; and are seemingly insatiable.

in

in the pursuit of these insects. When the numbers are reduced within reach, a hen will fly up against the walls, and brush them down with her wings, while her chicken seize them with great avidity. — This being repeated as often as they want food, the whole species will in a day or two be destroyed.

Of the *phalæna*, (moth) and small beetle, they seem equally voracious; on which account, I cannot but deem them the most useful instruments in nature for eradicating these noxious and destructive vermin. By this method, I have cleared two of my own granaries, which were infested by the weevils, very effectually.

I am, &c.

JOHN WAGSTAFFE.

Norwich, Jan. 26, 1786.

ARTICLE XLIV.

An Experiment made in Planting of Wheat.

[By Mr. ISAAC ROGERSON, Gardener.]

SIR,

IN answer to the Society's request in the papers, a small experiment which I made in planting of wheat is offered to their consideration.

When

When a few grains have been planted in a garden, or even in a field, at six or nine inches distance, the produce has often been twice, or four times as much as what is reaped in common per acre in proportion. And yet no one, that I ever read or heard of, has undertaken to give any other reason for this great difference, than that of the plants standing at such distance from each other, and being kept clear of weeds. Undoubtedly, these advantages contribute much towards the increased produce: but there is another cause which appears to have the greatest share in producing this effect, and that I have discovered.

It has indeed been mentioned by writers often as an *advantage*; but no one, that I know of, ever said it was the *chief cause* of a great crop. But if wheat, planted at such a distance as to be kept *always* clear of weeds, produce *only double* to what is reaped in common, (suppose forty-eight bushels, instead of twenty-four bushels) on good land, well prepared, that is twelve pounds instead of six pounds per acre in value. I wonder no gentleman ever tried this method, and published the *additional expence* above the common; the additional expence I think would be very little: and only think what additional produce, what a field for national, as well as particular improvement!

Please

Please to observe, this method differs from the drill husbandry; as in the latter, the whole land is not planted, the rows being ploughed between. It differs also from the setting method, as described in your first volume, as it does not appear the plants were *always* kept clear of weeds. But to come to the experiment.

On the 30th of August 1782, I marked out a square yard of ground, with four rows, nine inches apart; I put thirty grains of wheat in each row two inches deep, this I call No. I. Nov. 12, I took four plants out of each row, and transplanted to No. II. also a yard square.

No. I.		No. II.	
.....	26	45	5
.....	3	14	21
.....	19	2	29
.....	32	23	17

I kept both clear of weeds, and hoed one end of the rows, but I could not perceive any difference between that which was hoed, and that which was not hoed: I have discovered the cause. The number of stems of No. II. was as marked above.

The produce of No. I. was four hundred and seven ears, 1 lb. 5 oz. of corn; seven hundred and fifty

fifty grains weighed an ounce. The produce of No. II. was three hundred and thirty-three ears, 1 lb. 2 oz. 8 dwts. of corn; six hundred and eighty grains weighed an ounce. The value of the crop per acre of No. I. at 60 lb. per bushel, and five shillings per bushel, is 26l. 9s. 4d.

Now the great and important question is, what is the principal cause of so great a produce? There was no great expence,* and I am certain it was not the goodness of the land; the lightness of the grain seems to prove that: it has had no dung worth mentioning these twelve years. The snails having eaten the plants in winter, I put a little foot and lime on them, but that could not be the cause. There is much better wheat land not far from my house, and in the hands of a good farmer; and yet his crops are no more than about twenty-four bushels per acre.† It appears plainly, that there must be some particular cause, or causes, of this great produce; and likewise a cause, or causes, why good land produces so much less in common.

* This could not possibly be ascertained by so small an experiment. If Mr. R. would plant an acre in this manner, and keep an accurate account of the expence, some opinion might be formed how far it would be either practicable or profitable to attempt this mode of culture on a large scale. But nothing perfectly satisfactory, or in any respect decisive, with regard to general practice, can be proved from very small experiments.

† Three quarters of wheat per acre only, on good land, proves there must be some capital mismanagement in the mode of cultivation; as in the Eastern counties four, and very frequently five quarters are raised per acre on clover leys of one earth.

I wish, for the sake of publick good, that the Society may think it worth their notice to inquire into it; for my part, I shall be very glad to send an account, with very convincing proofs of the cause, and why hoeing the wheat did not make it better. And also offer a new mode of agriculture.

I am, Sir,

Your humble servant,

I. ROGERSON.

Bristol, August 11, 1784.

[Mr. R's further thoughts on these subjects will be acceptable to the Society.]

ARTICLE XLV.

A Table for Manuring Land.

[By the Rev. H. J. CLOSE.]

GENTLEMEN,

IT is some time since I sent you an account of a few experiments in agriculture. I now inclose for your approbation a table for manuring land, which seems to me a proper and necessary groundwork for every husbandman; and I think it will be a useful appendage to all publications on the subject. If you entertain the same opinion of it, you

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are at liberty to insert it in the next volume of those useful papers which the publick may be favoured with from your Society.

I am,

Your obedient humble servant,

H. J. CLOSE.

Trimley, Sept. 30, 1785.

A Table for Manuring Land.

Number of heaps to a Load.	1	2	3	4	5	6	7	8
At 5 yards distance	193	96	64	48	38	32	27	24
At 5½ yards	160	80	53	40	32	26	23	20
At 6 yards	134	67	44	33	26	22	19	16
At 6½ yards	114	57	38	28	22	19	16	14
At 7 yards	98	49	32	24	19	16	14	12
At 7½ yards	86	43	28	21	17	14	12	10
At 8 yards	75	37	25	18	15	12	10	9

Number of Loads to an Acre.

EXPLANATION of the first two Rows of Figures.

The number of heaps of one load each, laid at five yards distance, is 193 to cover an acre. Two heaps to a load, 96. Three heaps 64; and so on to the end. Each of the succeeding rows of figures to be read in the same manner.

ARTICLE XLVI.

Experiments on the Feeding of Swine.

[By GEORGE WINTER, esq.]

SIR,

SHOULD the following experiments be esteemed worthy the notice of the Bath Society, you are at full liberty to make them publick.

As swine is one of the most increasing, profitable, and sagacious* species of animals that can be kept on a farm, they must deserve the husbandman's particular attention. I will confine myself to such observations on this subject, as I have not yet seen made publick.

* I have observed the sagacity of swine to be equal to that of any domestick animal. The too general barbarous treatment of kicking and beating them, as if inanimate beings, only tends to make them vicious and furious. I do not permit any of my swine to be in the least abused, but give every encouragement to have them gently treated. By this mode, they will follow the boy who feeds them like so many dogs; and will, even in the open field, lay themselves down to be smoothed and played with.

One of my labourers living near me, was lately employed on a common in front of my house. I observed his pig grazing near him all the morning. When the man went to dinner, the pig followed him; when he returned to his work, the pig returned: which induced me to be very attentive; and I found that the pig continued grazing within ten yards of him the whole day. On enquiry, I was informed that he had not purchased this pig more than a fortnight before, when he was so unmanageable, that it was with difficulty he could drive him home; and that according to his usual method of the most gentle treatment, the man found that pigs could be so tamed, as to follow him wherever he would permit them.

From experience, I have found that swine prefer lucerne to clover. Last year I had a small spot of lucerne adjoining to a field of clover, to both which they had free access. When drove into the clover, they would immediately return to the lucerne, which manifestly proves it to be a sweeter feed for swine. The superior advantages of lucerne to clover, are great and many. Lucerne is not only earlier, and much more luxuriant in its growth, but will bear cutting four times in a season, and likewise flourish from fourteen to sixteen years longer than clover. The manure dropt by the pigs tends greatly to enrich the land it grows on: hence I am fully convinced of its superior advantages to every other culture.

I have experienced, that neither lucerne nor clover are of themselves a sufficient support for swine. A small quantity of corn, pease, or beans, (particularly in cold mornings) is essentially necessary to be given them, before they are turned out. Such food will warm and strengthen their stomachs, and prevent the bad consequences of a disorder generally called *the blood*;^{*} which from the following circumstances that occurred to me last April, I consider as an erroneous appellation.

* Mr. WINTER, in a volume of his *Essays*, published since the first Edition of this Volume, describes this disorder as proceeding from the real want of a sufficient quantity of blood, arising from the want of solid nourishing food.

My swine's feeding so heartily on lucerne and clover, prevented my bailiff's giving them any corn for some mornings. Soon after, I was informed that one of my pigs, near four months old, was affected with a disorder called *the blood*. I immediately attended, found the pig extended on the grafs, in rather an insensible state, with its dam near it, in a seeming condolent manner, bewailing the situation of its offspring. I ordered the pig to be put on its legs; it hung down its head, staggered, and again laid down. Its belly appeared to be full, and as my people assured me it was *the blood*, according to the general custom practised in this part of the country, I cut its tail, which bled a little. I had it carried to the sty, where it was followed by the dam. Then I ordered some barley-meal to be immediately scalded, and mixed with milk, which it would not eat, nor could any quantity be conveyed into its stomach by drenching. I tried several other methods to relieve it, but ineffectually. In a few hours after it died. From the appearance of its belly being full, I suspected it must have eaten some poisonous weeds, or swallowed some venomous insect; curiosity induced me to examine its viscera, and with all possible circumsppection; I first had its distended stomach opened, which contained only an elastick air, and a very small quantity of the meal, and milk which

was curdled. I took the same precaution in having its intestines opened, all which contained nothing but the same elastick air as the stomach, All its viscera were perfectly sound.

To prevent the other pigs being similarly attacked, I lost not a moment's time in preparing scalded barley-meal, which was mixed with milk, and given them blood-warm, with a small quantity of spirits of hartshorn; at first, I fed them but sparingly, and by degrees increased their quantity of food, till I thought them out of danger. Every morning after, I had them fed with corn before they were turned out; by this precaution they throve well.

Hence I am fully convinced, that lucerne or clover, without the assistance of some solid food, is not sufficient to support and nourish large swine; and that the diseases they are subject to chiefly arise from improper, unwholesome food, such as damaged musty grain, (too frequently given them) or common dirty wash, or the stale offal of the garden, which in general is esteemed good enough for pigs.

I have applied potatoes in different modes for feeding swine; giving them whole, or mashed in the water wherein they were boiled; or the last
mode

mode with barley-meal scalded and mixed in the trough. But from various and repeated experiments, I have found the following the most profitable method of applying potatoes, to not only the *rearing*, but likewise to *fattening* of hogs; varying the quantity given according to the circumstances of rearing, or fattening.

When rearing, a small quantity of food given once or twice a day, with lucerne, clover, grafs, and offals, is sufficient.

When fattening, a constant supply is essentially necessary, so as not to leave the troughs incumbered with stale meat, which should be cleared out, and given to store swine.

An iron furnace is the most salutary for boiling potatoes. Should time or conveniency not permit to have it emptied for several days, no bad consequence can ensue. Copper, or copper and lead, are extremely dangerous, as they generate poison; therefore, they should be immediately emptied and cleaned.

The method I have lately adopted, and always shall pursue, until a better be pointed out, is, to fill about three parts of a furnace with potatoes; when

when in proportion to every five bushels of potatoes, I scatter over them about a peck and half of barley-meal, then fill the furnace with potatoes, adding just as much water as will cover them. By this method, the barley-meal does not sink to the bottom of the furnace, where it will encrust and burn, nor will it be liable to be wasted by being boiled over. The nourishment of the barley is in a great degree extracted by the water. After the potatoes are well boiled, let the whole be mixed and bruised together in tubs, with a clean spade, so as to form a pulp. By this method, all the nutritive properties of the barley and potatoes are incorporated, and thereby much easier digested, and the hogs require no water.

In cold weather it should be given blood warm. My barley which was stained by the inclemency of the season in 1785, I had ground and used for this purpose; which prevented my purchasing *gurgians*, which is nearly, if not equally as nutritive as barley-meal, and much cheaper.

Swine, when fattening, should be kept as clean as possible, and well supplied with dry litter. As their pens are generally too small to admit of exercise, and as they immediately lie down after feeding, I have thought it necessary, twice or three
times

times a week, to add about three table spoonfuls of salt to a half bushel pail of food, which assists digestion, consolidates their food, and increases their appetites. When too great a quantity of salt is given, it then acts as a purgative, which prevents their food conveying the necessary nourishment.

About once a week, I have mixed two table spoonfuls of madder, which prevents obstructions, acting as a diuretick, and is at the same time an astringent. And on some other day in the week, I give a spoonful or two of an equal quantity of flour of sulphur, and salt-petre, well pounded and mixed; which purifies and cools the blood. All these different articles added to each pail of food in the morning, on separate days, entirely prevent the meazles, keep swine extremely healthy, and fatten them more expeditiously.

When some of my hogs were first penned up, they were affected with a violent cough, vulgarly called *the busk*; which the above ingredients entirely removed in a very short time.

It frequently happens, that swine are killed when disordered with the measles, which is easily discoverable by the meat or flesh containing small globular red or white pustules of different sizes, varying

ing according to the different degrees of the disease, which originates from their being fed with musty damaged corn, or some unwholesome food; or from their food being boiled in lead or copper vessels, in which it has lain too long; or from their being kept in a wet and dirty pen; either of which causes tends to obstruct the free circulation of the fluids; hence arise those globular pustules, which are the juices rendered viscid, and coagulated.

The different articles that I have pointed out as above, will entirely remove such obstructions; purify and promote the circulation of all the fluids; and tend greatly to expedite the fattening of hogs.

I must further observe, that hogs from the age of twelve to eighteen months are the most advantageous to be fed for bacon, as they have then attained their full growth, will require less food, and fatten much more expeditiously than hogs that are younger.

Annexed you have a particular account of two experiments, with such further observations as I deem necessary; and which, I flatter myself, may convey some useful information.

Your most obedient servant,

GEORGE WINTER.

*Pigs purchased in March 1785.**Dr.*

	<i>£.</i>	<i>s.</i>	<i>d.</i>
March 17. To Cash paid P. Highman for five porkers — — —	3	12	6
To expences at and driving from market	0	1	3
To 6 bushels barley (tailings) and grinding	0	16	6
To coal — — —	0	1	3
To 44 bushels of potatoes — — —	0	7	6
	<hr/>		
	4	19	0

*Pigs sold in April 1785.**Cr.*

1785. April 21. By 2 pigs sold to W. Hughes,

weight 5 score 7 lbs.

28. By 3 ditto 10 6

Total 15 score 13 lbs.

at 6s. 4d. a score, £4 19 0

OBSERVATIONS.

The potatoes were unsizeable for the Bristol market, as being the largest and smallest. They were put out of the furnace into tubs, and the barley-meal given promiscuously with the potatoes without being mashed. I could have sold those unsizeable potatoes at eight-pence per bushel in the country; but by this mode of application, I was only paid two-pence per bushel, and two-pence over on the whole. Hence I am convinced,

young

young porkers will not pay for being fattened with potatoes, by this method.

Hogs Varrowed. { 6, Jan. 14, 1785, } *Dr.*
 { 9, Feb. 17. }

£. s. d.

1785. Nov. 9.	To 12 penn'd up to fatten			
16.	To 2 ditto			
Dec. 26.	To 1 ditto			
	15 hogs valued at	15	0	0*
To coal	—	0	11	6
To 14 bushels of barley (stain'd) at 3s.		2	2	0
To grinding ditto	—	0	3	6
To 1½ lb. madder 13½d. salt 4s. 6d.		0	5	7½
To flour of sulphur, and salt-petre		0	1	1
To 306 bushels unsizeable potatoes		17	17	9½
		£. 36	1	6

Hogs, as per Contra, sold.

Cr.

1785-6.		score lbs.
Dec. 7.	By 2 hogs sold to W. Hughes	13 0
28.	By 3 ——— ditto	22 0
31.	By 3 ——— S. Collard	23 11
Jan. 4.	By 3 ——— A. Parker	20 16
12.	By 3 ——— ditto	22 12
Feb. 20.	By 1 ——— ditto	9 1
	Total	111 0
	at 6s. 6d. a score,	£. 36 1 6

* These hogs were driven to Bristol market the 27th of October, when I was offered no more than eighteen shillings each for the lot. I have valued them at twenty shillings each.

Observations.—The best season for purchasing hogs at the Bristol market, is about the latter part of October or beginning of November, when the milk season is expired, and all the corn fields gleaned. Therefore, I could have bought hogs of the same size as above, at the time mine were offered for sale, for about eighteen shillings to not exceeding nineteen shillings.

My hogs were only nine and ten months old when put to fatten; had they been full grown, I am convinced they would have paid much more than 14d. per bushel for the potatoes they ate.

The potatoes were entirely unsizable for the Bristol market, as being the smallest and largest. Most of the latter sort were watery and hollow, weighing from one pound and half to three pounds; worth (if sold in the country) from seven-pence to not exceeding eight-pence per bushel.

The barley being stained, maltsters and distillers refused to purchase it; and the highest price offered to me for it was three shillings per bushel, for the purpose of fattening hogs.

I could have purchased gurgians at two shillings and three-pence per bushel, which I apprehend would nearly, if not equally, have been as nutritive

tive as barley-meal; and thereby enhanced the value of the potatoes more than a halfpenny per bushel. Fourteen shillings being the difference of the cost of barley-meal and gurgians.

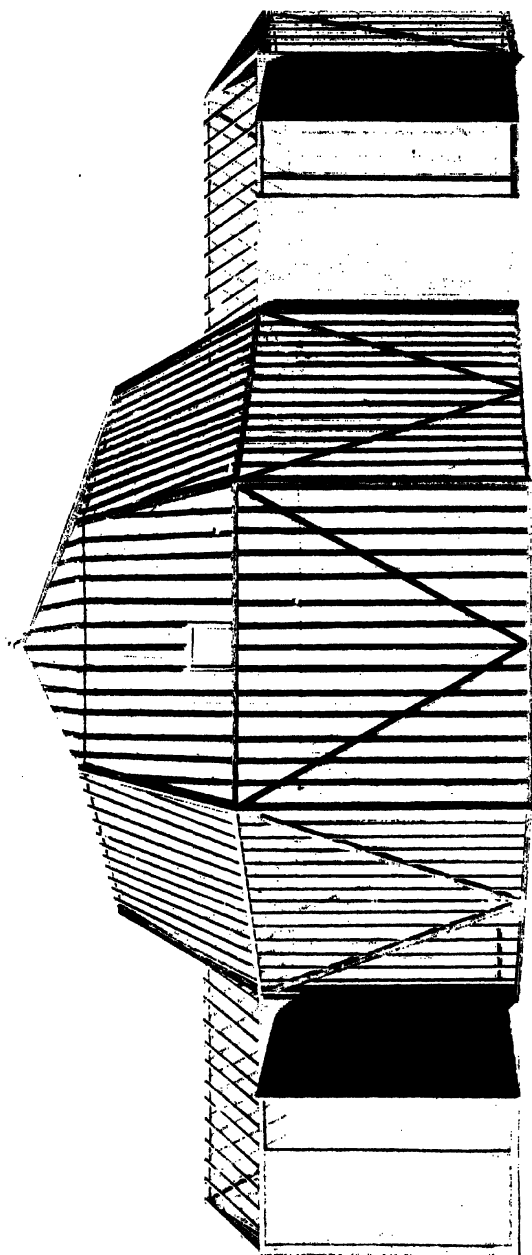
I have omitted making any charge for attending these hogs, as I deem the manure they have made equal in value to such expence.

GEORGE WINTER.

R E M A R K S.

“ We perfectly agree with Mr. WINTER, that large, or rather full-grown hogs yield a greater profit in feeding upon potatoes, than smaller ones. But in the experiments before us, the porkers seem to have been bought excessively dear, and not kept long enough to afford a fair trial of the meat. And if the large hogs had been kept a month longer, they would probably have yielded a larger profit, both from the advance of the price of their flesh in the following month, and because they are constantly observed to increase more in weight, and consume less food in the last month of their fattening.

“ We apprehend these experiments were made with the Surinam, or what is vulgarly called the white-blossomed potatoes, which have been found less nutritious than the common mealy potatoe. Besides, no just conclusion can be drawn from these experiments to ascertain the value of potatoes, as the hogs in both cases were too small to do justice to that application of them.



MODEL OF A BARN,

By W. Henry Jackson, of the City of New York.

“ We would recommend the full-grown Shropshire hogs, such as are purchased by the distillers at about two guineas a head when lean, as the sort most likely to pay a good price for the potatoes. These hogs, purchased in November or December, should be kept at least fifteen weeks, improving the quality of their food by a gradual addition of meal.”

ARTICLE XLVII.

Description of the Model of a Barn, for which a Premium was granted by the Society to Mr. HENRY DOBSON, Carpenter, of Norwich.

[With an accurate Copper-plate of the Model.]

GENTLEMEN,

FROM a desire of promoting the laudable designs of a Society established for so important a purpose as the improvement of agriculture, I have endeavoured, in compliance with its wishes, to construct a barn, on a plan which I believe the model herewith sent, and the following facts, will prove to be much superior to any now in use.

I have compared, as well as calculated the difference, both of space and quantity of timber of the present model, with a common barn without porches of the same area.

The

The ties and braces of barns, now in use, have always been a just cause of complaint with the farmer; the form of this renders these unnecessary; which not only makes the space occupied more commodious, but produces a considerable saving in the timber.

I am well aware, that the dimensions of the threshing-floors in this model will be objected to, as every innovation on common practice is; but to candid men, (and to such only improvements ought to be intrusted) they will be found quite sufficient.

I have observed, that the thresher seldom uses a larger space to thresh upon, than that assigned for this purpose in the present model; and the porches in common use, added to the enormous width of the barn, can serve for very little purpose more than a receptacle for the threshed corn; the bow at the end of each threshing-floor is intended for this purpose, and will contain near two lafts undressed or in sacks.

The only objection that remains is, the length not being sufficient to dress the corn upon, the usual method being to fling it with a shovel, as much spread as possible, to the distance of from 20
to

to twenty-six feet; by which means the heavier particles fly farthest, and the unsound corn and hulks are of course left in the intermediate space; as this part of the process occupies as little, if not less time than any other, it will not be difficult to find a sufficient time of fine weather in any season, to place a sail-cloth, or boards prepared for that purpose, to the distance of twelve or fourteen feet from the doors, which will then effectually answer every purpose of those now in use.*

The following are the dimensions of a barn 50 feet by $20\frac{1}{2}$ feet, and those of the model.

<i>Dimensions of the Model.</i>	<i>Dimensions of a common Barn.</i>
1472 square feet the area.	1475 square feet the area.
30,900 cubic feet for corn only.	24,426 cubic feet for corn only.
445 cubic feet of timber.	702 cubic feet of timber.

By which calculations it appears, that a barn built on the present model gains, on one in common use of the same area, 6474 cubic feet of space, and is built with 257 cubic feet of timber less; and as there is nothing in its construction which would increase the expence of workmanship, the difference between the expence of building a barn on

* As threshing is for the most part done in the winter months, when the barn doors are generally frequented by cattle, poultry, and birds, great inconvenience would be found in lengthening the floor by a sail-cloth or boards, as Mr. Dobson proposes. But if the corn be dressed with a winnowing engine (as is frequently practised in many counties) the length of the floor will be quite sufficient. In every other respect we think this the completest model for a barn we have ever seen.

this plan, and that of one in common use of the same area, would be as 445 is to 702.

It is needless to say any thing of its mathematical strength, as it must be obvious to any one who is at all acquainted with mechanics, that the present figure is of all others the best calculated to answer that purpose.

I am, &c.

HENRY DOBSON.

Norwich, Sept. 23, 1785.

[N. B. Mr. DOBSON writes, that the principal braces in the model, which are put in by mistake three inches by four inches, ought to be six by four, and are so accounted in cubing the quantity of timber.]

ARTICLE XLVIII.

*On Transplanting and Dividing the Roots of Wheat;
and of Harrowing, and Rolling the Crop.*

[In a Letter to the Secretary.]

SIR,

I HAD the pleasure to be informed by your letter of the 10th instant, that the Bath Society had done me the honour of printing my observations

tions on Transplanting and Dividing the roots of Wheat, in their second volume of Select Papers.* This flattering testimony of the approbation of so respectable a body of gentlemen, encourages me to offer something further on the subject, and (as you desire) to sign it with my name.

I have read the notes which the Society thought proper to add to my former letter, and give them my hearty approbation. What I have now to offer, is freely submitted to such remarks and animadversions as the superior judgment of the Committee may deem proper.

My imagination is still deeply engaged in the theory of the divisibility of corn; and I am exercising my invention in attempts to produce a plan whereby the theory may be reduced to practice. I am well pleased to find that the practice of harrowing and rolling corn, after it has sprung up, meets, and has received, the sanction of the Society. It has been one of my favourite schemes for some time past; and I am under a thorough conviction, that, were the practice to become general in this kingdom, it would be very rare to see a bad crop; and we should never feel the distressing effects of a scarcity of grain. Suffer me to intreat

* See Second Vol. Art. XVI.

the Society to take this subject into their most serious consideration: it is, in my humble opinion, an object of the utmost importance. I will not contend with such respectable authority as that of your Society, whether the good effect of harrowing and rolling all kinds of corn after it has sprung, be derived from pulverizing the soil, or subdividing the roots;* it is enough for my purpose, that the benefits arising from these operations are fully admitted. I will therefore venture to recommend the practice, as deserving in the highest degree every kind of encouragement, and do it on these principles:—

First. The operation is simple, and performed with such implements as every farmer has in his possession: of course, when, by being excited to make trial, the farmer is satisfied that it is a safe and beneficial operation, there will be little difficulty in reconciling him to the use of it.

2dly. As the drill and horse-hoeing husbandry does not, among common farmers, make so rapid a progress as from its great and superior advantages might have been expected, this method is the best that can be adopted on crops sown broadcast.

Certainly from the *former*, because the latter does not take place: few, if any, of the roots are divided by harrowing.

3dly. When

3^{dly}. When it comes more generally into practice, and is more carefully attended to, it must be the means of saving a great proportion of feed.‡

4^{thly}. By an increase of grain, an increase of fodder, and materials for manure, are acquired, which will amply repay the additional labour.

5^{thly}. As great labour is employed in fallowing land,* and yet the intended advantages are often defeated by unfavourable seasons; harrowing and rolling, by being performed at the critical period, will often remedy the evil.

Lastly. The harrows and roller are applied at the time when a field is left to its fate, and no further cultivation can be given it that season.

I am, &c.

ROBERT BOGLE.

Strand, June 23, 1783.

‡ Doubtless of *some*; but the drill husbandry is what (if generally practised) would save seed enough annually to feed half a million of people.

* This in general is very unnecessary: Wherever turnips are well cultivated, *summer* fallows are never wanted; and a judicious course of crops will render *winter* fallows, unless on wet stiff cold clays, needless. With a good course of crops, and judicious ploughings, there is very little land in this kingdom but what will yield a profitable crop every year.

EXTRACT OF

Another Letter from the above Gentleman.

— AS I am exceedingly impatient to have your opinion of my favourite speculation of propagating wheat by transplanting and dividing its roots in the spring, I beg you will, as soon as convenient, say what occurs on the subject.

Since I wrote to you last, I have conversed much with many practical farmers, who all admit that my plan has the appearance not only of being practical, but advantageous. I have also seen, in the ninth number of Mr. YOUNG'S Annals of Agriculture, the account of an experiment which strongly corroborates my theory. It was made by the Rev. Mr. PIKE, of Edmonton. From this, and other experiments which have been made under my own eye, I foresee clearly, that the system is practicable, and will certainly be productive of great benefit, should it become general. Besides the saving of nine-tenths of seed in the land sown broadcast, other very important advantages will attend the setting out of wheat from a seed-bed; such as, an early crop, the certainty of good crops, rendering a summer fallow unnecessary, saving dung, and having your wheat perfectly free from weeds, without either hand or horse-hoeing.

Five

Five hundred plants in April produced almost a bushel of grain. My gardener says, he can set one thousand plants in a day, which is confirmed by the opinion of two other gardeners. Mr. MILLER found no difference in the produce of what was planted on lands that had dung, and on what had none, except where the land was improper for wheat at all.

I have the honour to be, &c.

Nov. 25, 1785.

ROBERT BOGLE.

{Mr. BOGLE will see by the Society's Premium Book this year, that by having offered several premiums for experiments of the kind he so earnestly recommends, we wish to have his theory brought to the test of practice. Our reason for this, as well as for printing Mr. B's letter, was, rather to excite decisive trials by ingenious persons, than from any expectation of the practice ever becoming a general one. General, indeed, it never can be. A sufficient number of hands could not be found to do it. Unkindly seasons, at the time of transplanting and dividing the roots, would frequently endanger and injure, if not destroy the crops. But admitting the mode generally practicable, we very much doubt whether all the advantages he has enumerated would be derived from this mode of culture. Why should dividing and transplanting the roots of wheat cause the crop to be early, or afford a *certainty* of its being a *good one*? We cannot think that *less manure* is necessary in this method, than either in drilling or broadcast; nor can we by any means admit, that such crops would "be perfectly free from weeds without either hand or horse-hoeing."

We readily agree with Mr. BOGLE, that by this mode of culture, on a general scale, an immense quantity of seed-corn would be annually saved to the nation; and in this we believe the advantage, were it practicable, would principally consist.

April 1786.]

ARTICLE XLIX.

A Description of the Russian Ploughs.

[By Dr. GRIEVE, late Physician to the Russian army.]

SIR,

ON my road from Petersburg to Riga, I saw at Cuicatz a number of peasants tilling the ground with their small single-horse ploughs. These instruments of tillage, which would excite the derision of an English farmer, are used all over Russia. They are very simple, and consist only of two poles or shafts, to which the horse is harnessed, and which extend backward, behind him, between three and four feet. To this end is fixed a cross bar, by which the peasant holds and directs it. About six inches forward from his hold, there runs down, in an oblique direction to the earth, a stronger piece of wood, which is divided into two points at the lower end; these two points form two socks, and are shod with iron. They are two inches distant from each other, and gently curved towards the horse. From a rope joining the two upper shafts, runs down a small stick shod with iron, and so formed as to grasp one or other of the socks, being tied in such a manner that the peasant can move it from the one to the other at pleasure. This I call the turn glebe, as it turns the earth to
the

the right or left according as it is placed. When fixed on the right fock, it turns to the left, and *vice versa*. Thus a whole field is often tilled without changing sides; for at the end of the furrow, the peasant has only to change the *turn glebe*, and to return in the same track he came. The smallest and weakest horses are generally employed in this work; and I have often seen a woman, or a boy of fifteen, at once holding the plough and guiding the horse. The furrows they make are seldom more than three inches deep, notwithstanding the lightness of the soil.

I have frequently asked some of the Russian noblemen, why they did not introduce and adopt the English ploughs, which are much better fitted for turning up the soil from its bottom? The answers I received amounted to this, That in the present state of the Russian peasantry, each man has a certain portion of land allotted him as his own, and another portion he is to till for the landlord;—that he has seldom more than one, or at most two horses, which have neither size nor strength sufficient to work the English ploughs;—and that were two or more of them to join, still a four-horse plough would till but little more land in a season than their single-horse ones. But I found the most powerful reason was, that in the Southern provinces, the soil is so rich as to require it only
to

to be lightly scratched over, in order to its producing the most luxuriant crops of every kind of grain. On the contrary, in the Northern provinces, it is so poor and thin, that deep ploughing would only bury the fertile part, and turn up a caput mortuum to the surface.

I leave these answers to be judged of by those who have made agriculture their study; and shall only remark, that in the Northern Countries the soil must naturally be superficial, because the influence of the sun is so; and therefore to bury too deep that part of it which has already been fertilized, would be surely to lose a considerable part of its efficacy.

I am, &c.

Nov. 21, 1785.

J. GRIEVE.

ARTICLE L.

On the Utility of those Clubs called by the name of Friendly Societies, in Country Parishes.

GENTLEMEN,

AS I venerate every attempt, either in societies or in individuals, to promote useful knowledge, improvements in the necessary arts, and happiness in

in collective and civil society, I wish to point out one subject which seems in a particular manner to merit your attention and encouragement: this is, the establishment of Parochial *Friendly Societies* among handicraftsmen and poor labourers.

Where these have been established, and conducted by prudent rules and regulations, they have proved very comfortable resources to many individuals, when age or affliction has disqualified them for labour, and also lessened parochial expences.

The funds raised by these societies may be considered as so much money saved from the ale-house, to be applied in times of necessity to the best of purposes; and as each member contributes only *three-pence* a week, it is scarcely felt by individuals. But the advantage and relief which *seven shillings* a week affords to the *sick*, the *lame*, and the *aged*, is very comfortable; and they are thereby freed from the painful necessity of applying to their parishes for support.

As these *Friendly Societies* are founded on one of the wisest maxims in the code of human policy; namely, *that it is easily in the power of the many to help the few*; I think they merit publick encouragement and support. Therefore, if your finances
will

will admit, I think you cannot bestow a few guineas better than in offering a premium “ to the most numerous Society of this kind, of not less than forty members, which shall be established by labourers and handicraftsmen, in any country town or parish where no such Society is at present instituted. The said premium to be claimed as soon as the said Society, of not less than forty members, has subsisted one year.”

I have presumed to offer the above proposal on this principle, that whatever tends to make our labouring poor industrious and good œconomists, while in *health*, and to render them comfortable when under *affliction*, is worthy your consideration ; and that these friendly clubs or societies have such a tendency, is, I think, self-evident.

A poor man, flattered with the hope of receiving seven shillings per week in any future sickness, will either work extra hours for the three-pence he has to pay, or save it from the ale-house. After he has been some years a member, it becomes habitual ; and the fear of losing all the money he has paid in, by forfeiting all the advantage he, as a member, is entitled to in cases of accident or illness, will operate strongly in preventing him from declining his subscription. Resources of this kind have also a
tendency

tendency to preserve that honest pride and spirit of independency, which the poor generally lose when they submit to parochial maintenance.

I have talked with many poor men who are members of such Societies, and they all tell me they live as well as before, and find no difference at the year's end from having paid three-pence per week to their club. To use their own language, "*they don't feel it.*" But in times of sickness, when they could not labour, they have *joyfully felt* the comforts which their little publick fund yielded them.

You will pardon me, gentlemen, for dwelling so long on the subject; but as it strikes me forcibly, I wish to impress your minds with correspondent ideas of its utility.

I am, your's, &c.

Nov. 1, 1783.

A MEMBER.

In consequence of the preceding letter being laid before the Society, JOHN ANSTIE,* esq; of Devizes, transmitted to the Secretary the follow-

* The gentleman who has so honourably distinguished himself in detecting and endeavouring to prevent the illicit exportation of wool.

ing

ing state of facts, to shew the great utility of a Society of this kind in that town, and of which that gentleman is Treasurer.

S I R,

I SEND you an account of monies paid by one of the clubs established in this town from the year 1765, to the end of 1783. As all the members of this club may be considered as poor, it is not only probable, that if no such club had subsisted, *that the whole of this money* must have been drawn from the *Poor's Rates*, but even a larger sum: for on enquiry I find, that it is a very uncommon thing for the members of the club to apply to the parish on *any* occasion. The other clubs in the town are formed on nearly similar principles, and therefore I send you only the articles of this club.

Though such Societies should by all means be promoted, yet I am convinced, that the increase of the poor's rates, particularly in large towns, is owing in a great degree to the overseers being continued in their office only for one year; for before they become acquainted with the poor in the parish, they are subject to various impositions, and it being a disagreeable office, they are glad to get through it as easily and as soon as possible. Whereas, were there but constant officers, or were they chosen for
three

three or four years from the middle order of the inhabitants, with moderate salaries for their trouble; and were the more substantial persons of the parish to inspect their accounts quarterly, and give orders for such regulations as they might see necessary; the good effects of such a method, I believe, would soon be seen. I have served the office myself twice, the last time *voluntarily*, as the parish was very much in debt, and the rates increasing; and from my experience I am convinced, that if my business would have permitted me to have continued another year, I should have been able to have reduced the payments much more than they were when I quitted the office, though even then our *debts* were cleared. But no person of a liberal turn of mind can be persuaded to continue the mere drudgery of the office, though he might be willing to attend to the regulations of it.

I have thrown together my thoughts on this subject in haste. And am,

Your humble servant,

JOHN ANSTIE.

Devizes, Nov. 10, 1783.

Scriblers Club, held at the Black Horse, Devizes.

Cash drawn for Sick and Burials from Sept. 1765, to Sept. 1783, distinguishing each year.

J. FISH, *Book-keeper.*

<i>Number of Members.</i>				<i>Cash Paid.</i>		
				£.	s.	d.
1765 to 1766	.....	108	.....	48	0	5
1766 to 1767	.....	107	.....	58	15	5
1767 to 1768	.....	97	.....	41	10	11
1768 to 1769	.....	101	.....	40	17	6
1769 to 1770	.....	104	.....	40	18	0
1770 to 1771	.....	108	.....	41	2	6
1771 to 1772	.....	107	.....	57	17	6
1772 to 1773	.....	105	.....	47	14	2
1773 to 1774	.....	106	.....	27	11	0
1774 to 1775	.....	103	.....	38	9	6
1775 to 1776	.....	91	.....	51	1	4
1776 to 1777	.....	81	.....	41	12	6
1777 to 1778	.....	82	.....	38	18	0
1778 to 1779	.....	86	.....	38	18	0
1779 to 1780	.....	85	.....	23	6	9
1780 to 1781	.....	83	.....	31	0	4
1781 to 1782	.....	77	.....	42	6	0
1782 to 1783	.....	75	.....	38	15	3

Eighteen years £.748 15 1

The Annual Meeting in 1783, having read and considered the above letters, &c. it was resolved unanimously, as an encouragement to the establishing of such Societies in country parishes,

“ That

“ That a premium of ten guineas shall be given to the most numerous Friendly Society, consisting chiefly of handicraftsmen and labourers, which shall, before the first day of January, 1785, be established in any country town or parish, within either of the four counties, where no such society now subsists.

The conditions of this Premium are,

1st. That the society shall have been established one year, and consist of not fewer than forty members, when the claim is made.

2d. That none of the said members shall have belonged to any other club of this kind on the 1st of Jan. 1784.

3d. That no society shall be entitled to this premium, unless there be a clause inserted in their articles, that no part of their stock shall ever be laid out in the purchase of LOTTERY TICKETS, or in any other way which may risque any part of their property in games of chance.

4th. That as soon as their fund amounts to one hundred pounds, one half of it shall be laid out in government or land security.

5th. That should it increase in future so as to enable them to make any division of their principal among the members, they shall always, on making such division, leave at least one hundred pounds in stock.

6th. That every society that intends to claim this premium, shall, at the time of its institution, send a fair copy of their articles to this Society for inspection before printing them.

7th. That each claim shall be accompanied with a certificate signed by the Minister and Churchwardens of the parish; containing a printed copy of their articles, the amount of their stock, and the number of actual members, with their names and occupations.

Claims to be made at the meeting in September 1788.

It is recommended to farmers, &c. to promote these societies, by becoming members of them, as they evidently tend to lessen the poor's rates."

In consequence of this premium, several new Societies have been established, and others are forming, as the Society continues to offer the same premium for succeeding years.

ARTICLE LI.

Account of various Experiments made during a course of Three Years, to ascertain the Increase of Wheat and Barley; by Sir John Anstruther, bart. and by him communicated to the Bath Society.

GENTLEMEN,

IN order to discover what produce wheat would yield upon rich land in a garden, from different quantities of seed, several rows were planted, each row was twenty feet long, and there were two feet distance between the rows. The following was the produce:—

CROP,

Crop, 1783.—TABLE I.

EXPERIMENT	Grains per hole	HOLES.		Grains per Foot.	EARS.		per Ear	GRAINS.		per Square Foot
		Distance	per Foot		per Hole	after 1 Grain		after 1 Grain	per Foot	
I.	2	3	4	8	46	23	184	31	713	5704
II.	7	12	1	7	55	76	55	34	267	1870
										925

In 1784, the following rows were reckoned, the rows were twenty feet long, and three feet distant from each other.

TABLE II.

EXPERIMENT	Grains per Hole.	HOLES.		Gr. sown per Foot	EARS.		per Foot	GRAINS.		per Square Foot
		Inches dist.	per Foot		per Hole.	after 1 Grain		per Ear	after 1 Grain	
I.	2	3	4	8	16½	8	66	38	312	2508
II.	2	12	1	2	53	26½	53	35	937½	1855
III.	7	3	4	28	25	3½	100	39	139	3900
IV.	1	12	1	1	52	52	52	42	218	2184
V.	3	12	1	3	55	18½	55	45	825	2475
VI.	3	12	1	3	57	19	57	41	779	2337
Average || 43 || 21 || 63 || 40 || 533 || 2507 || 847										

In 1784, twelve rows were planted, two of each with the following number of grains, the rows 3 feet distant, and 28 feet long. In 1785, the average produce of every two rows was as follows:—

TABLE III.

EXPERIMENT	HOLES.		EARS.			GRAINS.			per Square Foot
	Grains per Hole	Diff. per Hole	No. per Foot	No. of grs. per ft	per Hole	per Foot	per Ear	after 1 Grain	
I.	2	3	4	8	10	5	40	51	255
II.	2	12	1	2	31	15½	31	51	790
III.	7	3	4	28	18½	2½	74	51	134
IV.	7	12	1	7	42½	6	42½	44	264
V.	1	3	4	4	18	4½	72	56	1008
VI.	1	12	1	1	29½	29½	29½	56	1652
Average									
|| 25 || 12½ || 48 || 51 || 68½ || 2488 || 829									

EXPLANATION of the TABLES. [See 2d Table as above.]

The 1st column denotes the number of the experiments	—	1
2d, the number of grains per hole	—	2
3d, the number of inches distance between the holes	—	3
4th, the number of holes per foot	—	4
5th, the number of grains set per foot	—	8
6th, the number of ears per hole	—	16½
7th, the number of ears from each grain	—	8½
8th, the number of ears per foot	—	66
9th, the number of grains per ear	—	38
10th, the number of grains from each grain	—	312
11th, the number of grains per foot	—	2508
12th, the number of grains per square foot	—	836

The average of every two rows is stated in the above table. The greatest increase after one, is from one grain per hole, and one hole per foot of the rows, and the rows at three feet distance.

Last year, one grain per foot in the rows produced 52 ears per hole, with 42 grains per ear; that is, 2184 grains after one; and as every grain has

has three feet of space, or 432 inches, this increase is 728 grains per square foot.

This year, one grain at the same distance produced $29\frac{1}{2}$ per hole or foot of rows, with 56 grains per ear, which is an increase of 1652 after one, and $550\frac{1}{2}$ per square foot.

The quantity of seed planted is at the rate of one-twelfth of a peck per acre.

By weighing several bushels of wheat of different kinds, and reckoning the grains in an ounce, it was found that the average weight was 60lb. per bushel; and that in one ounce, there were 700 grains of good wheat; and of small wheat, 760 grains. As there are 43560 square feet per acre, this multiplied by the grains per square foot, and divided by the grains in a bushel, will give the number of bushels per acre.

By this calculation, the 728 grains per square foot last year will amount to 47 bushels and three quarters of a peck per acre. And the 550 grains per square foot of this year will amount to 35 bushels $2\frac{1}{4}$ pecks per acre.

The greatest produce upon the foot square is from seven grains per hole, and four holes per foot in rows, or 28 grains per foot, although

this is the smallest increase after one. Last year the produce of grain planted at these distances was 25 ears per hole, or 100 per foot of rows; the ears had 39 grains each; which is only 139 grains after one, but is 1300 per square foot.

This year, that which was planted at 28 grains per foot, yielded $18\frac{1}{2}$ ears per hole, and 74 per foot, with 51 grains per ear, which is only 134 after one, and 1258 per square foot. The 28 grains per foot of rows, or $\frac{1}{3}$ square feet, has $15\frac{1}{2}$ inches of space per grain: and the seed is at the rate of two pecks and a half per acre.

The produce of last year, viz. 1300 grains per square foot, is at the rate of eighty-four bushels and three pecks per acre.

And the produce of this year, viz. 1258 grains per square foot, is at the rate of eighty-one bushels and two pecks per acre.*

This year one grain per hole, and four holes per square foot, yielded more than the 28 grains

* These variations of the produce of the experiments, shews how little a few small experiments can be depended upon to establish any system. The greatest produce in both these years, is from twenty-eight grains per foot of rows; they are more per square foot than the others with smaller quantities of seed. But one row with four holes per foot, and only one grain per hole, produced more than those. This experiment shews the great produce from one grain where it has space, and the great crops that rich ground may produce.

did, as it produced 1008 after one, and 1344 per square foot. All the rows with more grains per foot than one, yielded more in general than one grain. But one row with the same number of holes per foot, with two grains per hole, yielded only 235 grains after one, and 680 grains per square foot.

The average of the twelve rows per square foot is 829 grains; and by the above calculation, the produce is at the rate of fifty-three bushels and three pecks per acre of good grain. But upon weighing one ounce of this, there were 760 grains per ounce, which is one-twelfth more than is supposed in the above calculation, which would therefore make the produce of this and the others one-twelfth less.

As last year the greatest quantity of seed sown, viz. two pecks and a half, produced the greatest produce per acre, although the smallest increase after one; the increase after one was diminished from 2184 to 139. We see in the field that the increase is much diminished by great quantities; as where three bushels are sown, if each yielded twenty after one, the produce would be sixty bushels, whereas it is seldom above twenty or thirty, which is only from seven to ten after one.

To

To discover if this decrease continued in proportion to greater quantities of seed, some barley was planted in spring 1785 both in a garden and field; in the garden some rows were planted at one foot in the rows; and the rows were three feet distant; some with one and two grains per hole, and some with 14 and 15 per hole, and others with more holes per foot. In the field,* they were planted at nine inches every way, the first row with one grain per hole, and increasing the grains one every row to fourteen and fifteen; this is near three times the greatest quantity of seed of the wheat planted in the garden.

On viewing the crops in May, the planted wheat, where most grains were dropped, looked very well, and proved good plants; but those rows with few grains, and at one foot distance, were very bad, and had few stems. The barley in the

* The ridge dibbled with barley, was ninety-three yards and two feet long, and five yards broad, which is 468 square yards. The English acre is 4840 square yards, therefore, this ridge is the tenth and one-third of an acre; the produce of it, when threshed, was three firlots and two pecks and three quarters of barley measure; this is one half more than the wheat measure. Therefore this ridge produced five bushels two gallons and three quarters of wheat measure, or Winchester measure. By this proportion, the produce would be fifty-five bushels one gallon and three quarters per English acre.

* N. B. The wheat measure is about one per cent. more than Winchester.

garden,

garden, where there were few grains, and at one foot in rows, and at three feet distance, appeared extremely bad; those with most grains, and the holes nearest, were much the best. That in the field with one grain, and with few grains per hole, was very bad.

Upon examining them afterwards, when the wheat with most grains was about three feet high, the wheat with one and two grains was so bad, that it did not appear probable it would produce any thing like a crop. The barley was the same.

That in the field with one grain, and with few grains per hole, was bad; and as there were twelve rows, they increased in colour and length, as the number of grains. The first with one grain the worst; and those with fourteen and fifteen grains by much the best. But afterwards, those with few grains improved surprisingly, and were very good.

When in the ear, the wheat in the garden with few grains had several blanks in the rows where there were no plants, and when the ears were numbered, gave the quantity marked in the table of the barley in the garden; only those three rows which were at one foot in the rows could be reckoned, the others being so lodged, they could not be
numbered

numbered with any accuracy. Of these three, the produce from each hole could not be reckoned, but in each row there were twenty-eight holes at one foot; those with one and two grains gave 280 ears, which is ten per hole; but as the holes could not be counted, it appeared there were several holes that produced no ears, the seed having perished. Those with fourteen and fifteen gave 425, which is fifteen ears per hole; but the holes that had no ears could not be known. Of the barley in the field, the average of each row was taken at four different places.

Those with one and two grains, which appeared so bad in spring, and during part of the summer, yielded at the rate of twenty ears per hole; and up to eight, they yielded at an average twenty ears per hole; and from eight to fifteen grains, they gave on an average at the rate of twenty-four ears per hole. There was only one row with fifteen grains gave more.

On some land well prepared there was one ridge of wheat transplanted from a field, but the frost continued so long in the spring, that the wheat plants could not be got to transplant early, being so weak; and the spring being so dry, those planted in the beginning of April all died, although watered

at

at planting; the most of what grew were planted the 19th and 20th of that month. They are planted at nine inches in the row, and the rows at nine inches; this makes eighty-one square inches per plant; which would be 77440 plants per acre. The expence was nearly two pounds five shillings for taking up the plants, and planting them; but as it was a new thing, it was not so quickly done: if the people were accustomed to do it, I suppose it might be done for half the expence. The manner of doing it was as follows:

A man with a dibble, having five points of three inches long, walked backwards, and put them in with his foot in the manner a man digs with a spade; the dibble had a strong head, and a handle like a spade, into which these five points were fixed. A boy brought a basket full of plants from the man who dug them up, and having separated the sets, dipped the basket in a tub of water; a boy or woman put down a plant at every hole, and a man followed, planted them in the hole, and put the earth about them with a common dibble as a gardener does; they omitted to number the grains in the ear. The number of ears per plant were reckoned at four different places of the ridge, and the average was sixteen ears per plant; but there were a great many of the plants dead, and many
blanks

blanks in the rows. As this is eighty-one inches of space to the plant, this is at the rate of twenty-eight ears per square foot. If the ears had only thirty grains, this would by the former calculation be a great crop, and equal to the average in the garden this year. The grain was small, and one ounce contained 810 grains. The smallness of the grains might, probably, be occasioned by the late planting and the dryness of the season that followed.

This year the same experiment is again tried, with plants from seed sown in the garden in August last, and some from seed sown last year in October, and frequently cut over during summer.

I am, your obedient servant,

JOHN ANSTRUTHER.

London, Jan. 30, 1786.

ARTICLE LII.

Comparative view of two Crops of Barley, one drilled, and the other sown Broadcast in the same Field.

[By Sir JOHN ANSTRUTHER, Bart.]

GENTLEMEN,

I Herewith send you an account of an experiment made to ascertain the produce of drilled barley, compared with broadcast. The seed was sown on
the

the same field, and at the same time; and there was no apparent difference in the soil.

You may depend on this account being perfectly just.

The drills were eighteen inches wide, and the grain was dropt by hand, the expence of which was three shillings and three-pence per acre.

The seed drilled was one bushel and three gallons per acre. The produce was fifty-six bushels and three gallons per acre.

On the broadcast part, the seed sown was three bushels and five gallons per acre. The produce only thirty-six bushels and five gallons per acre.

Extra produce of the drilled crop about twenty bushels per acre; besides near two bushels of seed saved.

I am, &c.

JOHN ANSTRUTHER.

London, Feb. 10, 1786.



ARTICLE LIII.

*Short Extracts from the Letters of sundry Correspondents
on a variety of Agricultural Subjects.*

On Malt-dust as a Manure.

[By Mr. J. BEDFORD, of Birch-Manor, Essex.]

IN April 1784, I manured a piece of land with malt-combs, or the dust which falls through the wires, at the rate of four quarters per acre, and sowed it with clover and barley. The barley was very luxuriant, and produced very near seven quarters per acre. The crop of clover was one of the finest I ever saw; and I have no doubt, but the effects of this manure will be evident in the wheat next year. From the success attending the use of this malt-dust manure, the expence of which was only eight shillings per acre, it appears to be much cheaper than any other; and therefore I beg leave to recommend it to the notice of the Bath Society.

On the Same.

[By the Rev. WM. LAMPORT, of Honiton.]

ON my return from Cornwall, I met with a shrewd, sensible poor man, a husbandman, who observed that turnip seed two or three years old withstands

withstands the fly better than new seed. This idea is confirmed by a gentleman farmer who sows about eighty acres of turnips annually, and prefers the old seed.

If the above supposition be founded on fact, what is the cause of it? Is it not owing to the new seed being more moist, and on that account possessing that greater sweetness of taste which is so agreeable to the fly? Age, we know, takes off a great part of the sweetness in many vegetables; and there are numerous instances in the vegetable kingdom of old seed being found preferable to new.

On destroying Insects on Fruit-Trees.

By the Rev. Mr. SANDERS, of Sidmouth, Devon.]

AT the request of Mr. LAMPORT, the following experiment, successfully made on fruit-trees last year, is now submitted to the Bath Society's consideration.

I made a strong decoction of tobacco, and the tender shoots of elder, by pouring boiling water

* We wish this may become the subject of further enquiry by some of our ingenious correspondents.

on

on them; and sprinkled the trees with a small hearth-brush twice a week for two or three weeks, which effectually destroyed the insects. The like was tried in the garden of one of my friends, and the leaves retained their verdure until the fall of the year.

If used early, as soon as the bud unfolds itself, it will probably prevent the fly. The effect of tobacco has been long known; and elder-water, frequently sprinkled on honeysuckles and roses, has been found to prevent insects from lodging on them. All that is new in my practice is, the mixing them together: and the reasons are obvious.

The quantity made use of was, two gallons of water, two ounces of tobacco, and three or four handfuls of elder. It may, however, be made as strong as you please, it being perfectly innocent as to the tree itself.

Mr. BILLINGSLEY very justly observes, " It is a subject of much regret, that the counties within the limits of this Society should be so far behind many other counties in the article of ploughing. Vigorous attempts have been made by the Bath Society to introduce the Norfolk and other ploughs, calculated

calculated not only to expedite the work, but to render it less expensive; and their endeavours have been attended with no inconsiderable degree of success: yet I may safely say, that not one farmer in five hundred has followed the example, though many of them daily receive ocular demonstration of the inferiority of their own ill-constructed ploughs. To what can this blindness and obstinacy be owing? The farmers are quick-sighted enough in most other matters wherein their interest is concerned. I am therefore inclined to think, the fault lies more with the *ploughman* than with the master, whose indolence induces him rather to accommodate the *plough* to the *man*, than to exert himself in making the man accommodate himself to the plough."†

On Setting Wheat.

[By Sir THOMAS BEEVOR, bart. to the Secretary.]

— WITH regard to one fact mentioned in your last letter, I beg leave to set you right.

† Herein we think Mr. B. perfectly right; and therefore the Society have offered a premium to those ploughmen who shall most readily adopt and use properly the Norfolk plough.

It seems you have been informed by some of your correspondents, "that the practice of *setting* wheat declines in Norfolk." The gentlemen, I doubt not, speak *their* real opinion; but I am clear you are greatly misinformed, as from my own observation, as well as from the information of others in different parts of the county, there never was known so many acres *set* as in this and a few preceding years.

In a season when seed-corn is very cheap, or the autumn particularly unfavourable to the practice, it must certainly be lessened; in *light* lands for instance, a *very dry* time prevents dibbling, as the holes made with the instruments will be filled up again by the mould as fast as the instrument is withdrawn. So again, in a *wet* season, on *strong stiff clays*, the seeds in the holes cannot be well and properly covered by the bushes drawn over them; but these *extremes* of dry and wet do not often happen, nor do they affect lands of a moderately consistent texture, or both light and heavy soils, at the same time, so that the general practice is in fact never greatly impeded by them.



Made by W^m Winlow Engine Maker, Maynard St. at Cornhill Square Boston.

ARTICLE LIV.

*A Description of WM. WINLAW'S Patent MILL,
made upon a Plan entirely new, for separating the
Grain from the Ears of Corn, in place of Threshing.*

[With an Engraving.]

THIS mill was tried in June 1785, in the presence of many gentlemen, and gave the greatest satisfaction; and since then, to a great number of persons at sundry times, who all expressed great pleasure at seeing a performance so compleat, and the machine constructed upon a plan entirely new.

Upon trial, there were passed through the mill one bushel of the heads of wheat in one minute, with very moderate labour to the man that turned it; and, by experiment, it is found that four bushels of the ears will yield one bushel of clean grain. This being allowed, the difference will clearly appear betwixt the expedition of the mill and the labour of a thresher; allowing that a man will thresh six bushels in a day, of eight hours work, the mill will clear that quantity in twenty-four minutes, and to an incomparably greater degree of perfection than can possibly be done by the flail; for it separates every grain from the ears,

which must be allowed to be a very great saving; whereas much corn flies off by the flail, and a great deal is lost by foul threshing, either when performed by task or day-work; and by using the mill, all fraudulent practices will be prevented, and the straw preserved in its original reed, which must answer the essential purposes of thatching, &c. much better than when bruised under the flail, and every other purpose equally well.

The *improved Comb* for stripping the ears from the straw has been tried; and a lad, without having practised, combed out a bushel of ears in twenty minutes, which is at the rate of six bushels of clean corn for one day's work.

	£.	s.	d.
If women, children, &c. are employed for this purpose, at nine-pence per day, the expence of clearing a bushel of ears from the straw is	0	0	1½

The mill clears fifteen bushels of clean wheat in one hour, but allowing at an average only twelve bushels, which amounts to ninety-six bushels per day; if the man that works the mill is paid 16d. a day, the expence of the mill for one bushel is	0	0	0½
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Total expence per bushel	0	0	1½
--------------------------	---	---	----

But a thresher is paid for every bushel he threshes	0	0	4
---	---	---	---

There is consequently saved by the mill, on each bushel	0	0	2½
---	---	---	----

	£.	s.	d.
Which, for ninety-six bushels, or one day's work, amounts to	—	—	0 18 8

Besides, the mill produces one bushel in ten of clean corn more than what is done by the flail; and valuing a bushel of wheat at five shillings, the advantage gained on the ninety-six bushels will be

—	2	8	0
---	---	---	---

The mill will therefore gain in a day's work	3	6	8
--	---	---	---

The saving of grain by the mill is, the quantity flying off from the flail, and what is left in the straw by foul threshing.

If two lads are employed to strip the ears from the straw, they should clear seventy-two bushels per week, and the mill will separate the grain from the ears in six hours.

The saving of corn by using the mill, in preference to common threshing, being proved; the straw also is in a preferable state after it is cleared of the ears; it needs not be handled a second time to prepare it for the market, as it is all combed clean and fit for use, without any further time being bestowed in preparing it. The expence of repairing or relaying the barn floors should also be a consideration of the farmer, which the use of the mill entirely removes, besides saving the expence of threshing instruments, &c.

The argument of some farmers, in vindication of the old method of threshing, is, that the corn which flies off from the flail, and what is left in the straw, is not lost, as the cattle, hogs, and fowls, eat it; but that kind of argument must fail, when the consumption of the London market for straw is considered, and other large cities and towns within the kingdom; such straw being used for litter and other purposes. Therefore corn is equally lost in all those uses which straw is put to, as the hogs, fowls, &c. cannot be benefited by it as in the country; and it is reasonable to suppose, that every industrious intelligent farmer would wish to know as near as possible the neat produce of his farm, by having his crop clean threshed, so that there be little or none remain in the straw when measured out to his stock of beasts, poultry, &c. By so doing he will come at the expences he ought to know, and his straw be equally serviceable for the various purposes it is made use of in London or any where else.

I have tried the experiment of threshing the corn clean out from several trusses or bundles of straw, and found that a truss, which weighed thirty-six pounds, contained in it two pounds four ounces of wheat, which measured (after thoroughly cleared) two pints and a half. Thirty-six trusses are a load, and, according to this experiment, in one load are
 ninety

ninety pints, or five pecks and ten pints; consequently, in the thousands of loads consumed in this metropolis, there is a very great loss to the community; but the number is beyond my power to ascertain.

W. W.

Description of the Mill.

It requires very little practice to enable any person to manage the mill. The dart painted on the fly directs which way to turn the handle, it being pointed as it should be turned. The hopper, which serves to feed the mill, is regulated by the two round pins, to which the cords are fixed. The screw at the bottom of the frame is to adjust the distance of the inner nutt from the outward cone; for if it be screwed upwards too much, it will bruise the grain; if lowered down too far, it will admit the cars to pass without effect. The cross bars, that support the axis on which the fly and pinion are fixed, are moveable upward and downward as occasion requires. When the screw at bottom is turned to the right, it moves the nutt upward, and gives less space. The wedges must be slackened above, to admit the axle to rise upward or downward as may be found necessary. These wedges may be slackened or tightened with great ease, and without any danger of injuring the mill.

References

References to the annexed Plate.

A, A, A, A, the Frame of the Mill	G, the Top Curb surrounding the Nutt
B, the outward Cone	H, the Fly
C, the large Iron Wheel	Fig. 1. The Mill
D, the Regulating Screw	2. Combing the Sheaf
E, the Pinion	3. The Comb for strip- ping the Ears
F, the Hopper, to receive the Ears	4. The Hand Comb.

Directions for Combing the Bottom of the Sheaves, and stripping the Ears from the Straw.

The frame of the comb is made in the form of a cross, with a comb fixed to every limb, that four persons may work at once if requisite, according to the figure in the annexed plate. The teeth or prongs are made of steel, and of an angular form, set at convenient distances, so as to strip the ears clean; if set too wide apart, they will pass through without effect, and if too near together, will not admit the straw to go between.

The mill, upon a smaller scale, answers equally well for clover-seed; the flowers being first threshed off from the stems, it will clear as much seed from the outward integument or husk in three hours as a man can perform, in the common mode of threshing, in one week; for a man cannot clean much above a bushel in that time. The tediousness of
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the operation is an evident reason why the seed bears so high a price; the barn-floors are likewise quickly destroyed by that tedious forcible performance. It also answers for flax-seed, canary, or any other small seed; also for separating the husk from rice, which, by the present method in practice, is performed at a great expence of time and hard labour. The same methods may be observed in regulating the small mill for clover-seed, as the corn-mill.

The mill being capable of these performances, as above related, will render it very useful to gardeners, nurserymen, seedsmen, &c. as the whole is performed by one plain constructed machine, easily managed, and not liable to be out of repair.

The *objection* made by some gentlemen, against the mill coming into general use, is, their fear of not finding employment for their threshers. To this I answer; if gentlemen and farmers pay proper attention to improving their waste lands, and other improvements requisite in husbandry, they will be at no loss to find employment for their threshers.

The improvements made of late years in our cotton manufactories, by the help of useful improved engines, is sufficient to confute the notion which many people have, that those improvements
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are hurtful to the labouring interest of the kingdom, when it is plainly proved that the contrary is the fact, many thousands of poor people being employed by their means, which would not have had it in their power to get employment otherwise; consequently many of those would have been chargeable to their respective parishes, who now are useful members of Society.

If all men who are capable of combining mechanical powers, so as to make useful improvements in machines for various purposes, should agree in sentiment with those inconsiderate arguers, who obstinately persist in using only those implements which long custom has rendered most familiar to them, there would be a total stop put to all mechanical improvements whatever; for surely no man would be at the expence of time, labour, and materials, in improving or inventing machines to expedite labour, either in agriculture or mechanics, which would satisfy the ingenious enquiring part of mankind only, when, by the fallacious arguings of others, they are sure to be opposed, and find only disappointment, in their labour and expence, for the pains taken in endeavouring to serve the publick. But it frequently happens, that the more utility a new invention is of to the publick, the more numerous are its opposers; and the proprietor meets with almost insurmountable difficulties, before

fore those, for whose benefit it is intended, will condescend to make fair trial of the experiment; the common methods having been so long followed, renders many useful attempts of improvement abortive.

The method I would recommend to gentlemen, for a proper trial of the comb, is to employ some tractable, active person, either man or woman, void of prejudice, to practise for a month or two together; and in that time they will, by practice, have gained considerable experience, and be more active and capable of instructing others. I would have put this in practice myself, but have not an opportunity, wanting materials.

The farmers in Devonshire, and several other parts of the country, after combing the sheaves with the hand comb, cut the ears off with a common knife, and find it answer their purpose, both in respect to saving corn, and having their straw at once prepared for the various uses intended. This practice having been long established among them, they find no difficulty in performing the task; and it only requires the resolution of gentlemen in other counties, to oblige their servants to conform to the same rule, and obey their commands in this and every useful improvement in husbandry.

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The improved comb will clear three times the quantity in a given time, as can be done by the method practised in Devonshire; which ought to be considered as sufficient encouragement to make trial of the experiment.

ARTICLE LV.

Value of Turnip-Rooted Cabbage as a Spring Crop.

[By Sir Thomas Beavor, bart. to the Secretary.]

My good Friend,

MY turnip-rooted cabbages are now in high perfection. I have about three acres left, with which I am feeding twenty-two bullocks intended for fattening this summer; seventeen cows, two bulls, four young cattle, and one hundred and ten sheep, besides thirty horses, which partake largely of them. I hope and expect they will yet last near a fortnight more, by which time I doubt not but I shall have a full and plentiful bite of grass for all my stock. In order to ascertain in some degree the quantity of food they produced, I carefully selected some of them, and some of the common turnips; and having girted each of them with as much accuracy as possible, I found the turnip-rooted

rooted cabbage of the circumference of 18 inches, weighed $5\frac{1}{4}$ lb. and the common turnip of the same circumference $3\frac{1}{2}$ lb. only. I took others of different dimensions, and found throughout the result to be in that proportion. They were all without their tops, otherwise the exceeding of the turnip-rooted cabbage would have been greater; the tops of them being remarkably bushy. It must however be mentioned, that those roots were weighed at the latter end of March; had they been weighed at Christmas, it is likely the difference had not been so great. Still their late continuance for a green and most nourishing food, is indisputably a merit they must be allowed, beyond any other known vegetable production.

Our weather continues yet very cold, but moderate showers are forwarding vegetation in defiance of North-east winds. We have now snow, whilst I write this, but it melts as it falls.

I am, with real regard, your's,

THOMAS BEEVOR.

Hethel, May 1st, 1786.



ARTICLE LVI.

Calculations of the Weight per Bushel, and the Number of Grains, of sundry Seeds.

[By GEORGE WINTER, esq; of Charlton.]

ONE acre of land drilled at a foot distance, on ridges of 8 feet 3 inches wide, contains in length 505,880 inches.

A bushel of wheat, weighing 62 pounds, contains 516,000 grains. Dropping one grain to an inch requires less than a bushel to an acre.

A bushel of barley, weighing 52 pounds, contains 515,000 grains.

A bushel of Poplar or pig pease, weighing 64 pounds, contains 107,000 pease.

A bushel of horse beans, weighing 64 pounds, contains 35,000 beans.

A bushel of oats, weighing 32 pounds, contains 1,260,000 grains.

As all grain, &c. vary in size, the number contained in a bushel will be increased or diminished: but the above are the average numbers.

G. W.

ARTICLE LVII.

On the very great Advantages which may be derived from setting out Plants of Wheat, and other kinds of Corn, in the Autumn, Winter, and Spring.

WE must observe, that we received a letter from ROBERT BOGLE, esq; of Daldowin, near Glasgow, dated the 20th of April, 1783, signed R. B. recommending an experiment made by Mr. MILLER, Professor of Botany at Cambridge, in the year 1766, “ On the very great Produce of Wheat by Transplanting it,” to the attention of the Society; and Mr. BOGLE in that letter also recommended the practice of harrowing all kinds of corn in the spring where the appearance is unpromising. Our readers will find that letter and Mr. MILLER’s experiment in our second volume, page 156, and the substance of some others in the present volume.

Mr. BOGLE has since communicated to us his thoughts upon those two subjects at large, and also authentick accounts of several experiments which were made at his instance, and which were attended with very great success; but although we consider the objects recommended by him as worthy the attention of the publick, yet we have

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to regret that we have received his communications so late and so immediately on the eve of this publication, that we have neither time nor room to insert them at full length.

However, as we conceive his system may be attended with considerable advantages if brought into general practice, we shall state briefly a few of his leading principles; and must request, that such of our readers as may make, or may have already made, experiments either in transplanting or harrowing of corn after it is sprung up, will be pleased to favour us with accounts of the good or bad success attending them.

Mr. BOGLE states the following propositions:—

1st. That he has known many instances of very great crops having been obtained by harrowing fields of corn after they were sprouted; and therefore recommends the practice very warmly.

2^{dly}. That he has also received an authentick account of one instance where the same good effects were produced by ploughing the field.

3^{dly}. On the system of transplanting, he states, that a very great proportion of the seed will be saved, as a farmer may have a nursery, or small patch

patch of plants, from which his fields may be supplied; he calculates that one acre will yield plants sufficient for one hundred acres.

4tly. That a very great increase of crops may be obtained by this method, probably a double crop; nay, perhaps a triple quantity of what is reaped either by drilling, or by the broadcast husbandry.

5tly. That a great part of the labour may be performed by infirm men and women, and also by children, who are at present supported by the parish charity; and that of course the poor's rates may be considerably reduced.

6tly. That the expence will not exceed from 20s. to 30s. per acre, if the work be performed by able-bodied men and women; but that it will be much lower, if that proportion of the work which may be done by employing young boys and girls, should be allotted to them.

7tly. That in general he has found the distance of nine inches every way a very proper distance for setting out the plants at; but recommends them to be tried at other spaces, such as six, eight, or even twelve inches.

8^{thly}. That he conceives an earlier crop may be obtained in this manner, than can be obtained by any other mode of cultivation.

9^{thly}. That a clean crop may also be procured in this way, because if the land be ploughed immediately before the plants are set out, the corn will spring much quicker from the plants than the weeds will do from their seeds, and the corn will thereby bear down the growth of the weeds.

10^{thly}. That such lands as are overflowed in the winter and spring, and are of course unfit for sowing with wheat in the autumn, may be rendered fit for crops of wheat by planting them in the spring, or even in the summer.

11^{thly}. That he has known instances of wheat being transplanted in September, October, November, February, March, April, and even as late as the middle of May, which have all answered very well.

12^{thly}. That he has known an early kind of wheat sown as late as the middle of May, which has ripened in very good time; and from that circumstance he conceives, if the plants should be taken from that early kind, the season of transplanting

planting might be prolonged at least till the 1st of July, perhaps even later.

13^{thly}. That he has reason to think wheat, oats, and barley, are not annuals, but perennials, provided they are eaten down by cattle and sheep, or are kept low by the scythe or sickle; and are prevented from spindling or coming to the ear.

14^{thly}. That one very prevalent motive with him in prosecuting this plan, is, that he is of opinion, it may enable Government to devise means of supporting the vagrant poor, both old and young, who are now to be met with every where, both in towns and in the country, and who are at present a burden on the community: but if such employment could be struck out, a comfortable subsistence might be provided for them by means of their own labour and industry; and not only save the publick and private charitable contributions, but may also render that class of people useful and profitable subjects; instead of their remaining in a useless, wretched, and perhaps a profligate and vicious course of life.

And *lastly*, Mr. BOGLE has hinted at a secondary object which he has in view, from this mode of cultivation, which he apprehends may in time, with a small degree of attention, prove extremely advan-

tageous to Agriculture. It is, that the real and intrinsic value of different kinds of grain may be more accurately ascertained by making a comparison of it with a few plants of each kind set out at the same time, than can be done when sown in drills or broadcast; and when the most valuable kinds of wheat, oats, or barley, are discovered, he states, that in a very short time (not exceeding four or five years) a sufficient quantity of that valuable kind may be procured to supply the kingdom with seed from a single grain of each kind; for he calculates, that 47,000 grains of wheat may be produced by divisibility in two years and three months.

Although Mr. BOGLE appears to be too sanguine in his expectations of seeing his plan realized in *general practice*, we think it merits the attention of Gentlemen Farmers, and wish them to make fair experiments, and report their success. Every grand improvement has been, and ever will be, progressive. They must necessarily originate with Gentlemen; and thence the circle is extended by almost imperceptible degrees over provinces and countries. At all events, Mr. BOGLE is justly entitled to the thanks of the Society, and of the publick, for the great attention he has paid to the subject.

A P P E N D I X:

CONTAINING AN ACCOUNT OF

E X P E R I M E N T S

O N

E N G L I S H R H U B A R B,

B Y

DRS. FALCONER, PARRY, AND FOTHERGILL.

W I T H

THE OPINIONS OF SEVERAL OTHER MEDICAL GENTLEMEN
ON ITS QUALITY AND VIRTUES.

Examination of two Parcels of English Rhubarb, marked No. I. and No. II. sent to the Agricultural Society at Bath, in consequence of their Advertisement for a Premium, relative to the raising that Drug in perfection in this Country.

By W. FALCONER, M. D. F. R. S. Physician to the General Hospital;

And C. H. PARRY, M. D. Physician to the Pauper Charity, Bath.

THE specimens of rhubarb No. I. and No. II. were both in a rude state, being simply cut in a transverse direction into pieces of various thickness. Some of the pieces had holes bored through the center, but the greater part had not. The bark was, we believe, stripped off, but no farther dressing was attempted; consequently, the outside was irregular and unsightly. The center parts of many pieces were also in a soft, and rather decaying state. The pieces varied much in size, being from about three-quarters of an inch to four inches or more in diameter.

When broken, they appeared in general brittle, but moderately dry, firm, and solid; of a woody contexture, and not hard, flinty, or horny, though some of the lesser pieces seemed to be inclining to these qualities. In colour, they were of a whitish ground, with numerous red streaks, resembling the inside of a nutmeg; but smaller and closer placed. No. I. in this respect, seemed superior to No. II. in general; but this was not an universal remark, as one piece which we chanced to select of No. II. was equal, if not superior, to any of No. I. which we examined. When chewed, the taste of each was nearly alike, being in both
bitter

bitter and astringent, and resembling the peculiar flavour of good rhubarb. They also tinged the saliva of a deep yellowish red colour. The smell of each was pleasant and aromatic, though but in a small degree. No. I. in general had all these qualities in a somewhat superior degree to No. II. The internal structure of some of the best pieces when broken was scarcely discernible from that of Turkey rhubarb, and No. I. in general (in this respect) approached the nearest: but both were, we think, superior to the East-Indian, which inclined rather to a brick colour; whereas the others were rather of a crimson hue.—They were both reduced to powder with sufficient ease, but No. I. rather the easier of the two, and scarcely differing in facility of pulverization from the Turkey rhubarb. When powdered, No. I. was most similar to Turkey rhubarb in colour, being a tolerably bright and fair yellow; whereas No. II. was paler and more dull, one specimen only excepted, before referred to.

In taste, No. I. was superior to No. II. both in aromatic flavour, and also in sensible astringency. No. II. seemed, however, to have a flavour full as delicate as the East-Indian rhubarb.

The specific gravity of the four different kinds of rhubarb was as follows, with regard to distilled water of sixty-two degrees of temperature:—

East-Indian	—	—	1,046 to 1,000
English Rhubarb, No. II.	—	—	1,005
Turkey Rhubarb	—	—	,829
English Rhubarb, No. I.	—	—	,792

EXPERIMENT I. An ounce troy weight of the rhubarbs No. I. No. II. and of fine Turkey rhubarb, all in fine powders, were
severally

severally put into brass shallow pans, with twenty-four ounces by measure of spring water to each. These were severally evaporated by slow boiling to sixteen ounces each, and were then strained through a piece of coarse muslin. The colour of each of the strained liquors was as follows:—

No. I. a dark reddish brown.

No. II. much the same hue, but darker.

The Turkey rhubarb was more of a red tinge, and lightest coloured of any, and had the most aromatic scent. No. I. seemed to be next in degree to the Turkey.

EXP. II. Half an ounce of East-Indian rhubarb in powder, (being all we had then in our possession) was treated in the same manner as those before mentioned; only with half the quantity of water, which was boiled down in the same proportion. The infusion nearly resembled the others, save that it was of a deeper colour. That of the Turkey rhubarb was in taste the most bitter and aromatic of any; the East-Indian and No. I. were the most astringent; and No. II. weakest in all respects. The aromatic flavour was however greatly diminished in all of them by boiling. The precipitation at the bottom of the infusion of Turkey rhubarb, that subsided on cooling, was considerably larger than any of the others. All the infusions, when cold, were to appearance equally turbid.

EXP. III. Six ounces by measure of the infusions of No. I. No. II. and of the Turkey rhubarb, and three ounces of the infusion of the East-Indian, were put two days after the first experiment into brass pans, the same as used in Experiment I. and evaporated to a thick syrup consistence, and poured separately into earthen saucers. The colour of them all whilst fluid varied little one from the other, being of a dark clear reddish brown. The taste of them all was strongly bitter, but with little aromatic flavour. The extract from the Turkey rhubarb seemed to retain

most of the aromatic taste. The next in degree was No. I.—No. II. and the East-Indian were nearly alike.

When become dry and hard, as all the extracts were in a few days, those of the Turkey and East-Indian rhubarbs assumed a clear glossy surface. No. I. was rough, but rather shining; and No. II. rough and dusky. In point of consistence, those of the Turkey and East-Indian rhubarbs were extremely brittle, and broke into clear glossy small pieces; that of No. I. had a considerable degree of tenacity; and No. II. still more of that quality.

EXP. IV. Nine grains of the above four extracts, accurately weighed, were put into four separate tea-cups, and half an ounce by measure of rectified spirits of wine poured upon each; after standing six hours, the spirits were tinged of a deep yellow colour, darkest in the East-Indian; next in the Turkey, next in No. I.; and No. II. the palest of any. The spirits were then poured off from all, and the same quantity of fresh spirits added, which was repeated five times, at the end of each of which the spirits in all of them were coloured in the order above described, but much paler than at first. The residua from each were then collected carefully and dried; they were all rather slimy, and mucilaginous in the mouth, and soluble in the saliva, and had but little taste of any kind. No. I. was of a pale yellow colour and brittle texture, and weighed one grain and three quarters. The Turkey rhubarb was of rather a darker colour in general, though intermixed with some of a paler hue, and weighed the same as No. I. —No. II. was of a lighter colour, and weighed two grains and three-quarters.—The East-Indian resembled the Turkey, and weighed one grain.

EXP. V. Three drachms of the four kinds of rhubarb mentioned above, were severally put into four ounces of rectified spirits of wine, and corked up; after several days standing they were filtered. The East-Indian rhubarb had acquired a dark yellowish red colour. No. I. and the Turkey had a similar tinge, but lighter; and differing but little from one another. No. II. was of a similar hue, but lighter still.

EXP. VI.

Exp. VI. Two ounces by measure of each of the above tinctures were severally poured into earthen-ware saucers, and slowly evaporated to a moderately hard consistence. The colour of the residuum was nearly alike in all, being a yellowish red, brighter than the watery extract. The taste in all was bitterish, and considerably astringent; most so in the East-Indian; next in the Turkey; next in No. I.; and No. II. least of any. That of No. I. weighed thirty-two grains; that of No. II. eighteen grains; that of the Turkey rhubarb forty-three grains; and the East-Indian rhubarb thirty-eight grains.

N. B. They all attracted moisture from the air, so as to soften in some degree on standing.

Exp. VII. A tincture of the four kinds of rhubarb was made, in the proportion of an ounce to a pint of brandy, but without the addition of any other ingredient. The colour scarcely differed from that in rectified spirits. The Turkey and the East-Indian were so nearly alike, as scarcely to be discernible one from the other, being both of a dark yellowish red. No. 1. was the next in intenseness of colour; and No. II. the palest of any.

Exp. VIII. Four slips of card pasteboard were severally dipped in the watery infusions described in Experiment I. and suffered to dry. The Turkey rhubarb gave the deepest yellow colour; the next was the East-Indian; the next No. I.; and No. II. was the palest of any.

Exp. IX. Four slips of white pasteboard were dipped into the tinctures in rectified spirits mentioned in Experiment V. and suffered to dry. The East-Indian rhubarb gave the deepest colour; next to that the Turkey; next was No. I.; and No. II. the palest of any.

Exp. X. The same experiment was made with the tinctures in brandy mentioned in Experiment VII. The Turkey rhubarb gave the deepest colour; next the East-Indian; next No. I.; and No. II. was the palest of any.

Exp. XI.

EXP. XI. Two scruples of green vitriol were dissolved in six ounces of spring water; of this solution twenty drops were respectively put into four wine glasses, each containing an ounce by measure of spring water. To each of these was put respectively one drachm by measure of the several infusions of rhubarb mentioned in Experiment I. A black or dark brown colour was presently produced in all of them, so deep as to obscure the transparency of the liquors, and of course prevent any just comparison. A clean pen was dipped into each, and some words written therewith on a card; those written with that wherein the infusion of the East-Indian rhubarb had been put, were the darkest coloured. No. I. and the Turkey were nearly alike: and No. II. considerably the palest.

EXP. XII. The same experiment was repeated, save that instead of one drachm of the watery infusion, one drachm of the tincture in rectified spirits was substituted. They all became in a short time so black, as to obscure all distinction. A pen was therefore dipped into each of them, and words written upon a white piece of card pasteboard as in the last Experiment. The Turkey rhubarb gave the deepest colour; next to that the East-Indian; next No. I.; and No. II. the palest of any.

Experiments with the Rhubarbs, No. I. and No. II. made at the General Hospital, by Mr. FARNELL, the Apothecary; a very sensible, accurate, and well-informed Person.

CASE I.

JAMES JENKINS, aged 33, afflicted with a paralytic affection of his lower extremities, and an involuntary discharge of urine, took of the powder No. II. half a drachm, in two ounces of simple peppermint water, at seven in the morning; it produced four evacuations about six hours after, and operated without griping.

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The same person, some time after, complained of a pain in his stomach, which continued the whole day, and prevented his taking food. At bed-time he took fifteen grains of No. II. his pain abated, and he lay easy all night, and had one lax motion next day.

CASE II. John Deane, aged 54, troubled with a rheumatick disorder in his stomach and limbs, took half a drachm of No. II. which produced three motions about seven hours after being taken, and without griping.

A fortnight after the same person, being taken with a pain in his stomach, took a gentle emetick; and the next day complaining of a gnawing pain in his stomach, took one scruple of the rhubarb No. I. in two ounces of simple peppermint water; this gave ease, but produced one operation only; he said that it warmed his stomach and limbs very much.

CASE III. James Elliot, aged 23, afflicted with a violent pain in his hip, and a general weakness of body, took half a drachm of powder of rhubarb, No. II. in simple peppermint water; after being taken four hours, it operated three times without griping.

CASE IV. William Symonds, aged 45, afflicted with pains in his limbs, attended with swellings of the joints, took half a drachm of No. II. as above, in simple peppermint water: it operated five times in about four hours after being taken, with a little griping.

CASE V. Thomas Shaw, aged 31, afflicted with rheumatick pains, and of a scorbutick habit, took half a drachm of the powder No. II. in simple peppermint water: it operated three times six hours after being taken, without griping.

CASE VI. Elizabeth Roberts, aged 24, afflicted with rheumatick pains, took half a drachm as above of No. II. it operated twice in twelve hours after being taken, with a little griping.

CASE VII.

CASE VII. John Way, aged 60, afflicted with rheumatick pains and trembling in his hands, took half a drachm of No. II. it operated four times in eight hours, and without griping.

CASE VIII. Jeremiah Norris, aged 50, afflicted with a paralytick disorder, took half a drachm of No. I. in two ounces of simple peppermint water: It did not operate for twelve hours after being taken, and then once only that day, and once the next, with much griping. He said, however, that his body was difficult to be operated upon by purgatives.

CASE IX. W. French, aged 30, of a weak habit of body, was taken with a vomiting and purging; he took ten grains of the rhubarb No. I. which checked it; he lay easy all night, and his complaint ceased.

CASE X. Grace Herbert, aged 20, a leprous patient, was seized with a purging after bathing: half a scruple of No. II. in simple peppermint water was given, which checked it, and she continued well.

CASE XI. Francis Green, aged 40, afflicted with a paralytick complaint of his lower extremities, took half a drachm of No. II. in simple peppermint water; he being easy to work, it operated six times in eight hours after being taken, and without griping.

CASE XII. W. Golding, aged 23, afflicted with a pain in his right hip, took half a drachm of powder of rhubarb, No. II. in simple peppermint water; it griped him much, and operated but twice that day: he had one motion the next day, but not a lax one.

N. B. None of the above persons were very robust, nor were any confined to their beds. Their urine on the day of taking it was tinged of a yellow colour, as is customary on taking the other kinds of rhubarb. The patients did not complain of much sickness.

The following Experiments were also made in the General Hospital, by Mr. FARNELL, with the English Rhubarb, No. I.

CASE XIII. Sarah Rogers, aged 50, labouring under a leprous complaint of the moist kind, took half a drachm of the rhubarb, with two ounces of simple peppermint water, at seven o'clock in the morning; it procured two motions about nine o'clock in the evening. A little sickness, and griping pains, continued the whole day. No stool for two days after.

CASE XIV. Peter Philips, aged 23, labouring under a leprosy of the dry kind, took two scruples of the powder as above; it procured three motions by six o'clock in the evening, without sickness or griping, and he had a stool next day as usual.

CASE XV. Wm. Young, aged 12, afflicted with a paralytick complaint, attended with an incontinency of urine, took half a drachm as above; it procured four stools by three o'clock in the afternoon, no complaint in the stomach or bowels attended its operation; had a stool next day; brought off a great deal of water.

CASE XVI. John Green, aged 3, afflicted with a paralytick complaint, took twelve grains in a little syrup of roses; it operated three times that day, and twice the next day.

CASE XVII. Philip Lodge, aged 50, leprous, took two scruples as above; it operated four times, without any complaint; had a stool the next day.

CASE XVIII. Ann Johnson, aged 25, afflicted with rheumatick pains, took half a drachm as before; it operated twice in the evening, with a little sickness and griping; no stool for two days after.

CASE XIX. Mary Farrier, aged 30, afflicted with rheumatick pains, and weakness of her bowels, took half a drachm, as before; it operated twice in the evening without any complaint; had a stool the next day.

CASE XX.

CASE XX. James Creedy, aged 40, great weakness of his lower limbs, and a weakness of his bowels, took half a drachm as before; it operated three times by nine in the evening, without any complaint; had no stool for two days after.

CASE XXI. Eliz. Frampton, aged 36, afflicted with pains in her thighs, and a laxity of her bowels, took a scruple, as before; it procured two stools in the evening, without any complaint; she was very open the next day, and at times is too much so; takes half a scruple at bed-time, which at intervals, with a drachm of elixir paregoric, answers very well, keeping her easy all night.

CASE XXII. John Blandy, aged 25, leprous, took 50 grains as before; it operated twice in the evening, without much complaint; had no stool for two days after.

CASE XXIII. Sarah Howley, aged 8, paralytick weakness of her left side, from fits, took twenty-five grains in simple mint-water; it operated three times by five o'clock P. M. without any sickness; had no stool for two days after.

CASE XXIV. Judith Wyard, aged 28, afflicted with rheumatic pains, and loss of the use of her lower limbs, took two scruples as before; it operated twice the next day, with much griping; took two scruples more that morning before it operated. —She mentioned after, that she seldom has a stool oftener than once a week.

CASE XXV. Joseph White, aged 14, general rheumatism, took two scruples as before, it operated three times that evening, with a little griping; had a motion the next day as usual.

CASE XXVI. Sarah Webley, aged 28, general rheumatism, took two scruples as before; it operated three times that afternoon, without any sickness, but a little griping; had no stool for three days afterwards, till the above was repeated.

CASE XXVII. Margaret Land, aged 34, general rheumatism, took two scruples as before; it operated twice in the afternoon, with sickness and griping pains; had a stool next morning.

CASE XXVIII.

CASE XXVIII. Mary Sherry, aged 40, afflicted with violent pain in her bowels, with sickness and acidities in the stomach, took two scruples of the pulv. rhæi Ang. with six grains of sal absinth. in simple peppermint water; it operated four times that day, with very little sickness or pain; had a stool the next day.

CASE XXIX. Eliz. Pearce, aged 36, afflicted with rheumatick gout, took two scruples, as before, joined with half a scruple of spic. aromatic; it operated three times that day without any complaint; had no stool for two days after.

Several patients have been at times afflicted with slight purgings, and by taking fifteen grains or a scruple of the pulv. rhæi Anglic. in simple mint water, with the addition of one drachm of paregorick elixir, or fifteen drops of thebaick tincture, at bed-time, have been much relieved; sooner with the opiate than without it, they being easy all night, and in general a motion being produced the next day.

*Remarks upon, and Conclusions from the above
Experiments.*

[By Dr. FALCONER.]

THE two parcels of rhubarb, No. I. and No. II. appear, from the specimens examined, to answer in external marks to the characters of good rhubarb: though unsightly on the outside, their structure, when broken, corresponded with those marks which are esteemed to indicate the perfection of the drug. The writers on the *Materia Medica* say, that good rhubarb should be dry, firm, and solid, but not flinty or hard; easily pulverisable, variegated on the inside with numerous pale red streaks, resembling a nutmeg;* appearing, when powdered, of a bright yellow co-

* Carthusius; Lewis Mat. Med.; Vogel. Mat. Medic.

lour, of a bitter astringent taste, and peculiar flavour, with an aromattick quality, manifest to the smell as well as taste.

All these qualities both the rhubarbs possessed in a tolerable degree; rather inferior in delicacy of taste to the Turkey rhubarb, but superior in some respects to the East-Indian: perhaps they might resemble the Turkey rhubarb still more nearly, had they been dug up as long a time, as rhubarb is said to have its red colour improved by keeping. The careful selection of the best pieces only of the Russian or Turkey rhubarb makes it appear to great advantage.

Vogel* relates, that an apothecary is sent with the Russian body of merchants that go to the borders of China, to purchase rhubarb, to whom all the rhubarb is delivered; who is strictly ordered to select carefully the best pieces only, and to burn all the decayed or bad. Upon the arrival of the rhubarb so selected, at Moscow or Peterburgh, it is again put into the hands of persons skilled in pharmacy, who have the care of its being properly dressed and cleared of the hard, woody, decayed parts, and other excrescences (as parts of the bark, &c.) that may remain; and to take particular care that no other kinds of rhubarb but the true be admitted: so that after all these cautions, none but the choicest and fairest pieces can be exported,

From what has been mentioned in the above examination of English rhubarb, we see how much one piece of the same piece may differ from another; so that a selection of the best pieces is indispensibly necessary; and were this and some other circumstances attended to, the British rhubarb

* Vogel's Med. Lib. p. 10. recommends rhubarb to be kept ten years from the time of gathering, in the best manner, to the Improvement of Physick.

might,

might, for aught that appears to the contrary, equal any of the foreign.

Another precaution that appears highly necessary is, the cutting out the central part of every piece of the root. It is found by experience that the internal pieces, perhaps from their proximity to the sap, are moistest and most subject to decay, as was before observed about the English rhubarbs; and when any part comes into this state, the infection soon spreads and damages the whole of the piece. It is doubtless, therefore, to avoid this, that the pieces of Russian rhubarb have all holes (and those pretty large) cut through their centre, which have been generally thought to have been made only to serve the purpose of hanging up, but appear to be for one material purpose besides. Some of the best pieces of the English rhubarb had holes bored through them; one particularly of No. II. of which I have taken notice above; but these holes were not sufficiently large to clear away the spongy and decaying parts: larger holes, therefore, are undoubtedly required.

Another defect in the specimens of rhubarb above examined is, that the outside is not scraped, or rather rasped, as the foreign rhubarbs are:—This not only gives it a shrivelled and mean appearance and colour, but is really of great disservice, by obstructing the quickness of drying, from the pores not being laid open for the herbaceous moisture to exhale. Though the bark be stripped off, the larger pores running mostly longitudinally, do not open laterally, and of course the watery fluid is confined, and exudes very slowly.

It is probable, that a great improvement might be made in the preparation of the English rhubarb, by accelerating its drying. It was formerly thought that plants were best

dried in a slow and gradual manner, which is now found to be a mistake; and that as quick a drying as is consistent with the safety of the vegetable substance, preserves best the efficacious qualities of the plant.*

Too much light is indeed thought to do injury, as it impairs the colour, and perhaps (though even that is dubious) dissipates some of the finer and more efficacious parts; but culinary heat is free from that objection, and at the same time possesses all the advantages of quick drying.

I have been lately informed by a gentleman of great experience in pharmacy, that the collectors of simples, about London, now furnish dried herbs in infinitely greater perfection than formerly; their flavour, colour, and odour, being scarcely inferior to that of the fresh vegetable, which is owing entirely to their being quickly dried. The application of this hint to those who raise and dress our indigenous rhubarb for the market, may be of service.

The first and second experiments shew the similarity of the rhubarbs, No. I. and No. II. to the Turkey and East-Indian, as far as regards those parts water is capable of dissolving. The Turkey rhubarb, however, appears to contain the largest proportion of any, of matter soluble in water, and to retain most of an aromack flavour.

The third and fourth experiments shew the proportion which the gummy, and perhaps inert, matter bears to the resinous, and probably the more active. No. II. contains, according to experiment 17. the largest proportion of gum or mucilage, and the East-Indian the least. No. I. and the Turkey were nearly alike; but I suspect the resin was

* Lewis's preface to his *Mat. Medica.*—New Dispensatory, 2d edit. p. 252.

not entirely extracted, though fresh spirits were five times poured on the residua, as it retained a dark colour to the last. The tenacity of the residuum of No. I. and No. II. and the brittleness and shining resinous appearance of the Turkey and East-Indian residua, are strong proofs of the two latter containing a larger proportion of resin.

It is highly probable, that the resin facilitates the solution of gum or mucilage in spirits, much as gum renders oils or resins soluble in water. The solubility of some of the gum resins, as aloes, asafœtida, gum ammoniacum, &c. either in water or spirits, is a strong presumption in favour of this opinion. At any rate, these experiments rather tend to shew the superiority of the foreign rhubarbs, as stomachick and astringent remedies; but I am not clear, if the larger proportion of mucilage with which the resinous part of the English rhubarb is combined, may not render its operation as a purgative more easy. The resin of jalap, which is so irritating when given alone, is rendered a safe and easy cathartick, by combining it with mucilaginous bodies.*

The fifth and sixth experiments shew the different proportions of resin contained in the several kinds of rhubarb. No. I. in this respect is far superior to No. II. and the foreign rhubarbs are still more abundant. It should be observed, that the peculiar flavour and taste of the rhubarb does not reside in the resinous parts, but probably in some essential oil still more subtle. Though resins and essential oils resemble each other very strongly, yet they are often found separate. The peculiar flavour of the clove is contained in its essential oil; its acrimony in the resinous part.†

The seventh experiment is made with brandy, in the same proportion with that used in the London pharma-

* Lewis's Mat. Med. Art. Jalapium.—New Dispensatory, p. 410.

† Lewis's Dispensatory, p. 360.

copœia. The foreign rhubarbs seem in this, as well as in the foregoing experiments, to contain the largest proportion of active soluble matter.

The eighth, ninth, and tenth experiments, afford a more accurate examination of the colour of the rhubarbs in infusion and tincture. The Turkey seems to possess the largest quantity of the colouring ingredient (which is certainly the resinous part) soluble in water or brandy; and the East-Indian rhubarb, most of what is soluble in rectified spirits. No. II. was, in these as in the other experiments, the weakest of any.

Experiments XI. and XII. are intended to shew the various degrees of astringency possessed by the several rhubarbs, of which quality the precipitation of iron from an acid menstruum in form of ink, is thought to be an accurate test.* The East-Indian rhubarb possessed this quality most strongly in the watery infusion; No. I. and the Turkey were nearly alike; and No. II. the weakest. In the spirituous tincture, the Turkey was the strongest; next the East-Indian; next No. I.; and No. II. the weakest.

The experiments tried with the rhubarbs at the Bath Hospital shew, that both the portions of English rhubarb possess both the purgative and astringent qualities of the foreign. Their purgative qualities seem to be scarcely so strong as those of the Turkey, or even of the East-Indian; but the difference is not great. Some persons in the profession, with whom I have conversed, seem to think, that about three parts of the Turkey, or four of the East-

* The astringent and colouring principles are not the same; for the latter appears strongly to impregnate the urine of those who take the different kinds of rhubarb; but urine so tinged does not acquire a dark colour on being mixed with a solution of iron.

Indian, operate as much as five of the English rhubarb; but others think the difference is scarcely so great. In point of astringency, the English rhubarbs do not perceptibly differ from the foreign.

Finally—If the English rhubarb should be allowed to be inferior to the foreign, (which is perhaps doubtful) it appears probable that this inferiority is owing only to such circumstances as are in the power of attention and industry to obviate, and that this might be done in a good measure by attending to the following particulars:—

1st; A due regard to the age of the plant when taken up.—2dly; To its being cut transversely, rasped on the outside, having the sappy parts cut out, and being quickly dried.—3dly; To its being kept some time (how long experience will dictate) after it is dry, before it be used.

Experiments relative to the Medical Effects of Turkey Rhubarb, and of the English Rhubarbs, No. I. and No. II. made on Patients of the Pauper Charity.

[By Dr. PARRY.]

N. B. The mark (—) in the second column, signifies that the number of stools was unknown.

CLASS I.

Comparative Effects of the three Kinds.

Harriet Allen, aged 1½ year: Disease, sickness and purging after the confluent small-pox; on the 25th of April 1785, she took eight grains of ipecacuanha, which operated well.

ENGLISH

ENGLISH RHUBARB No. II.

	Dose in grains.	Stools.	
April 26	10	3	with a little griping.
27		4	less watery than before.
28	10	1	before 12 at noon.
29		—	

ENGLISH RHUBARB No. I.

	Grains.	Stools.	
April 30	10	4	no griping.
May 1		3	
2	10	2	before 12 at noon with some griping.
3		2	with some griping.

TURKEY RHUBARB.

May 4	10	4	with considerable griping.
5		2	with griping.
6		1	
7	10	3	with griping.
8		0	free from complaint.

2. Mary Best, aged 74: Disease, violent pain in her stomach, increased by swallowing, with head-ache and costiveness.

ENGLISH RHUBARB No. II.

1785.			
Feb. 22		0	
23		1	
24	35	0	the powder taken at bed-time.
25		2	no griping.
26	35	0	the powder taken at bed-time.
27		4	slight griping.

ENGLISH RHUBARB No. I.

Feb. 28	35	0	the powder taken at bed-time.
March 1	35	5 or 6	before night, after which the second powder was taken.
2		5 or 6	Pain of the stomach and head were much relieved, but afterwards increased.

TURKEY

TURKEY RHUBARB.

	Grains.		Stools.	
17	35		1	no griping.
18			0	
19			1	
20			1	
21	35		—	flight griping.
22			3	
23			1	
24			0	

ENGLISH RHUBARB No. II.

25	35		2	flight griping.
26			1	
27			1	
28			1	
29	35		2	flight griping.
30			1	
31			1	

ENGLISH RHUBARB No. I.

April 7	35		0	powder taken at bed-time. with flight griping.
8			3	
9			0	
10			1	
11	35		0	powder taken at bed-time. with flight griping.
12			0	
13			3	
14			0	

During the past week she took every day a drachm of spirituous tincture of rhubarb, with simple bitter infusion and chalybeate wine, which after the 14th were omitted.

TURKEY RHUBARB.

15	35		0	powder taken at bed-time. with flight griping.
16			3	
17			1	
18			0	
19	35		—	powder taken at bed-time. flight griping.
20			3	

3. Hannah Foster, aged about 38: Disease, catarrh, with flatulency and costiveness.

ENGLISH

ENGLISH RHUBARB No. II.

		Grains.	Stools.	
1785.				
Jan.	12	35	3	no griping.
	13		2	
	14		—	
April	15	35	2	slight griping.
	16		3	slight griping.
	17		1	
	18	35	—	powder taken at night.
	19		4	slight griping.
	20		1	
	21		2	
	22	35	1	powder taken at night.
	23		4	slight griping.
	24		1	

TURKEY RHUBARB.

25			2	
26	35		—	powder taken at night.
27			3	great griping.
28			0	
29	35		2	slight griping.
30			0	
31			2	

ENGLISH RHUBARB No. I.

Feb.	2	35	2	slight griping.
	3		—	
	4		—	
	5	35	2	slight griping.

4. Mary Newman, aged $15\frac{1}{2}$: Disease, pain in the pit of her stomach, passing through to the back, with faintness, costiveness, &c. She was ordered to bathe twice a week.

TURKEY RHUBARB.

Mar.	15		1	
	16		0	
	17		1	
	18	18	1	great griping.
	19		0	
	20		0	
	21		2	
	22	18	1	with great pain in her stomach and back.
	23		0	
	24		0	

ENGLISH RHUBARB No. II.

	Grains.	Stools.	
25	18	1	great griping.
26		1	
27		0	
28		1	
29	18	1	great griping.
30		0	
31		1	

ENGLISH RHUBARB No. I.

April	1	18	1	flight griping.
	2		1	
	3		1	
	4		0	
	5	18	2	flight griping.
	6		1	
	7		1	All complaints removed

5. Elizabeth Hovey, aged 30: Disease, loss of appetite, sickness and great flatulency: usually a stool every other day.

ENGLISH RHUBARB No. II.

1784.				
Dec.	16		1	
	17	35	2	considerable griping.
	18		0	
	19	35	1	great griping.
	20		0	
	21		1	} great costiveness during this time
Jan.	4		0	
	5		0	
	6		0	

ENGLISH RHUBARB No. I.

1785.				
Jan.	7	35	3	flight griping.
	8		0	
	9		0	
	10		0	
	11	35	5	the two last stools with considerable
	12		1	griping.
	13		1	

TURKEY RHUBARB.

	Grains.	Stools.	
Jan. 14	35	2	flight griping.
15		0	
16		1	
17		0	
18	35	3	flight griping.

6. Jane Middleton aged 26: Disease, loss of appetite and sickness, occurring by fits, which flatulency, pain in her bowels, and costiveness: took first an emetick, and afterwards, through the whole of the disease, a bark mixture.

ENGLISH RHUBARB No. II.

Jan. 19	35	0	great griping.
20		0	
21		1	
22		0	
23	35	1	less griping.
24		—	

ENGLISH RHUBARB No. I.

25	35	6	flight griping.
26		1	
27	35	1	b fac 12 at noon with griping.
28		—	

TURKEY RHUBARB.

29	35	4	flight griping
30		3	
31	35	0	before 12 at noon; but flight griping.

7. Jane Middleton's child, aged 5 weeks: Disease costiveness.

ENGLISH RHUBARB No. I.

Jan. 20	7	0	apparently with great griping.
21		1	
22		0	
23		1	
24		1	
25	10	—	powder taken at night.
26	10	2	with apparent griping all day, before the second 10 grains, which were taken at night.
27		0	before 12 at noon.

TURKEY RHUBARB.

		Grains.		Stools.	
Jan.	28	10	—	—	powder taken at night,
	29		2	2	with griping.
	30	10	1	1	powder taken at night,
	31		0	0	before 12 at noon.

ENGLISH RHUBARB No. II.

Feb.	1	10	—	—	powder taken at night.
	2		2	2	with griping.
	3		0	0	

8. Mary Penny, aged about 50: Disease, pain in the stomach and bowels, after eating: one stool a day.

ENGLISH RHUBARB No. II.

1784.					
Sept.	23		1	—	
	24	25	2	2	confiderable griping.
	25		—	—	
	26		—	—	
	27		—	—	
	28	25	2	2	confiderable griping.
	29		—	—	
	30		0	0	

TURKEY RHUBARB.

Oct.	1		—	—	
	2	25	2	2	no griping.
	3		0	0	
	4	25	0	0	

ENGLISH RHUBARB No. I.

		25	—	—	
			0	0	
			0	0	
		25	0	0	
10			0	0	
11			0	0	
12	30		2	2	flight griping.
13			0	0	
14			0	0	
15	30		3	3	

9. Bridget Hatherfidge, aged 2 $\frac{1}{2}$: Disease, considerable hardness and swelling in the belly, with two loose stools a day.

TURKEY RHUBARB.

	Grains.	Stools.	
1784.			
Nov. 16	10	9 or 10	a good deal of griping.
17		0	
18		5 or 6	
19	10	8 or 9	a good deal of griping.
20		2 or 3	
21		3	
22		2 or 3	

ENGLISH RHUBARB No. II.

Nov. 23	10	12 or 13	sickness and a good deal of griping.
24		7	
25		6	
26	10	10	less griping.
27		6	
28		4	
29		2	

ENGLISH RHUBARB No. I.

Nov. 30	10	2	no griping.
Dec. 1		0	
2		0	
3	10	2	flight griping.
4		—	
5		—	
6		1	

10. Thomas Gore, aged 35: Head-ach, with pain and sourness in his stomach, and costiveness.

ENGLISH RHUBARB No. II.

1784.			
Oct. 8	30	0	} costiveness during this time, as before.
9			
10			
11			
12	30	0	
13			
14			

TURKEY RHUBARB.

	Grains.	Stools.	
Oct. 15	30	1	great griping.
16		0	
17	30	1	great griping.
18		0	

ENGLISH RHUBARB No. I.

Oct. 19	30	2	considerable griping.
20		0	
21		0	
22	30	2	considerable griping.
23		0	
24		1	
25		0	

ENGLISH RHUBARB No. II.

Oct. 26	30	2	considerable griping.
27		0	
28		1	
29	30	2	le's griping.
30		0	
31		1	

CLASS II.

Miscellaneous Comparative Experiments.

1. Esther Rolf, aged 33: Discafe, flatulency and pain in the stomach, with costiveness.

ENGLISH RHUBARB No. I.

Sept. 28	30	5	no griping.
29		1	
30		1	
Oct. 1		1	
2	30	5	no griping.

ENGLISH RHUBARB No. II.

Oct. 12	30	3 or 4	slight griping.
13			} bowels regularly open.
14			
15			
16	30	3 or 4	slight griping.
17			} bowels regularly open.
18			
19			

2. Sarah Stuart, aged 33: Disease, pain and flatulency in the stomach, with costiveness.

ENGLISH RHUBARB No. I.

	Grains.	Stools.	
1784.			
Oct. 5	25	3	slight griping with the last stool.
6		0	
7		1	
8	25	1	slight griping.
9		0	
10		1	
11		0	
12	30	3	great griping.
13		0	
14		1	
15	30	2	no griping.
16		0	
17		0	
18		1	

ENGLISH RHUBARB No. II.

Oct. 19	30	1	considerable griping.
20		1	
21		0	
22	30	2	slight griping with the first stool; considerable with the second.
23		0	
24		1	
25		0	

TURKEY RHUBARB.

Oct. 26	25	2	the last stool with griping and sickness.
27		0	
28		1	
29	25	1	no griping.
30		0	
31		1	

3. William Greenaway, aged 8: Disease, pain in his head and bowels, sickness, and purging four times a day: he took first two vomits of ipecacuanha, but the purging still continued.

ENGLISH RHUBARB No. II.

	Grains.	Stools.	
Mar. 15	12	6	no griping.
16		1	
17		—	
18	12	2 or 3	no griping.
19		—	
20		—	
21		—	purging cured.

ENGLISH RHUBARB No. I.

April 7		—	purging somewhat returned.
8	12	4	no griping.
9		—	
10		3 or 4	
14			bowels open ever since the 10th, without purging.

CLASS III.

Miscellaneous Experiments.

1. Thomas Saunders, aged 27: Disease, purging of brown stools for two months, without blood or scybala, to the amount now of near forty per diem, with great flatulency and griping: took first a vomit of ipecacuanha.

ENGLISH RHUBARB No. I.

April 26	30	6 or 7	less griping than before.
27		5	
28		3	before one at noon, with great griping, sickness, and vomiting.

2. Charles Philips, aged 3 $\frac{1}{4}$: Disease, putrid fever, with slight purging of white stools.

ENGLISH RHUBARB No. I.

Dec. 2	8	5 or 6	no griping.
3		—	} fewer stools on these days than on the 2d infant.
4		—	
5		—	
6	8	5 or 6	no griping.
7		—	purging much diminished.

3. Mary Pye, aged 19: Disease, flight purging, &c.

ENGLISH RHUBARB No. I.

	Grains.	Stools.
Oct. 8	25	0
9		1
10	25	1
11		0

4. Eliz. Gibbons, aged 2 $\frac{1}{2}$: Disease, purging thrice a day.

ENGLISH RHUBARB No. II.

Sept. 26		3	} three or four more stools on the interm- diate days than on those on which the rhubarb was taken.
27		3	
28	8	4	
29		3	
30		3	
Oct. 1	8	3	
2		3	
3		3	
4		3	
5	10		
6			
7			
8	10		

5. Hannah White, aged 28: Disease, violent purging, with pain in the bowels, and considerable feverish heat.

ENGLISH RHUBARB No. II.

Nov. 5	30	2	pain in the bowels considerably less than before.
6			} more than two stools on each of these days.
7			
8	30	2	Pain less than the preceding days. Purging afterwards more violent than before.

6. Jane White, aged 9 $\frac{1}{4}$: Disease, purging for two days, of three or four stools a day.

ENGLISH RHUBARB No. II.

	Grains.	Stools.	
Feb. 2	15	2	flight griping.
4		3 or 4	
5		3 or 4	
6	15	4	flight griping.
10		—	purging much removed

7. Elizabeth Hosey, jun. aged 4 $\frac{1}{2}$: Disease, clay-coloured stools.

ENGLISH RHUBARB No. II.

Dec. 15		2	
16		1	
17	14	3	no griping.
18		1	
19		3	no griping.
20		1	
21		1	stools of the natural colour.

8. Elizabeth Hibbert, aged about 60: Disease, pain in the bowels.

ENGLISH RHUBARB No. I.

Oct. 8	35	3	
9		—	
10	35	3	
11		—	
12		—	
13	35	3	
14		—	
15	45	3	great griping.
16		0	
17		0	
18	45	4	great griping.



Observations on the comparative Purgative and Astringent Effects of the several Kinds of Rhubarb.

[By Dr. PARRY.]

FROM the first class of these experiments it appears, that the Turkey rhubarb operated more than either of the two others, in one case only. No. I. operated most frequently in four cases. No. II. most frequently in two cases. The Turkey operated least frequently in two cases. No. I. in three. No. II. in three. In two cases the Turkey and No. II. operated equally; while in one of these No. I. acted more powerfully than either, and in the other not at all. In one case No. I. and No. II. acted alike; and both more than the Turkey. One exhibition of each kind of the rhubarbs produced equal effects in the case of Jane Middleton's child; but neither the Turkey rhubarb, nor No. I. in two other experiments on the same patient, operated at all before twelve the next day, when her mother called on me.

So far as these few experiments go, we may infer that the specimen of English rhubarb No. I. was fully equal in its purgative effects to the Turkey, and that they are both in quality somewhat superior to No. II. This conclusion is farther strengthened by the experiments in the cases of Greenaway, Rolf, and Stuart, Class II. In the last of these, the English rhubarb No. I. was more powerful than the Turkey, and in all three than No. II. It must also be observed that in the two first experiments with No. II. in the case of Gore, no effect was produced by the quantity it there exhibited.

The astringent effects of rhubarb may be divided into two kinds: those which seem immediately to arise from the

the medicine; and those which appear after it has operated as a purgative. The chemical experiments above-recited shew the existence of an astringent principle in all the rhubarbs, and the degree in which it takes place; but we cannot from thence draw any certain conclusion with respect to their operation on the human body. I have known the gum kino, the strongest vegetable with regard to taste with which we are acquainted, purge more violently than jalap. How far, indeed, the astringent quality of rhubarb with regard to the bowels is separable from its power as an aperient, and whether therefore it possesses that quality in a higher degree than any other purgative equally drastic, experience, I think, has not hitherto ascertained.

Let us however examine the properties of our different kinds of rhubarb in cases of diarrhœa, in which alone we can form a true judgment of their effects. In the examples of Gibbons and H. White, the rhubarb No. II. shewed an immediate power of diminishing the number of stools; for in both there were fewer motions on the days on which it was taken, than on others. This also appeared from the first exhibition of the same rhubarb in the several cases of Greenaway, Jane White, and Allen. No. I. seemed to have the same property in the cases of Pye and Saunders; but the Turkey rhubarb in no instance. To shew these effects still more clearly, we may observe, that in seven of fourteen experiments made in the above cases of diarrhœa with the rhubarb No. II. that medicine diminished the number of stools the day on which it was given; No. I. in two of ten experiments; the Turkey in no instance out of four.

To enter into a disquisition concerning the cause of these differences, would belong more properly to a col-

lection of medical than agricultural essays: but I think it probable, that the rhubarb No. II. diminished the number of motions not by any direct astringency, but by its gently cathartick power, which was just such as to stimulate the bowels sufficiently to make them discharge the greatest part of their contents in a few evacuations; while the other rhubarbs, by their stronger purgative quality, produced also a considerable discharge of the mucus of the bowels. This conclusion seems to correspond with the comparative costiveness which succeeded the cathartick operation of each rhubarb; that being much alike after the Turkey rhubarb and No. I.; and after both much greater than from No. II. although the latter was sufficient to remove the purging in the cases of Greenaway and Jane White.

Observations and Experiments on certain Specimens of English and Foreign Rhubarb, being an Attempt towards estimating their comparative Virtues.

Tentanda est via—— VIRG.

[By A. FOTHERGILL, M. D. F. R. S.]

IT is remarkable that Botanists, till very lately, have been greatly divided in their opinion concerning the species to which the officinal rhubarb belongs. Thus the *rheum palmatum*, the *undulatum*, and the *compactum*, have each in their turn been pronounced to be the true species. At length the question appears to be determined by the celebrated Dr. PALLAS, in favour of the first of these; and as he had every advantage of examining them on the spot, we may now, I think, safely conclude that the *palmatum* is the genuine plant. How far indeed the *hybrid* plant, produced from the union of the *palmatum* and *undulatum*,

dulatum, may hereafter be found equal, or (as some think) superior to either of the parent plants, must be left to future observation.

At present, the *palmatum* only demands our attention. If this plant can, by proper attention to its culture, and manner of preparing it, be brought at length to rival the foreign rhubarbs, which are annually imported at a very heavy expence, it will certainly become a considerable acquisition to this country. The Turkey, the Russian, and even the East-Indian rhubarbs, at present, it must be confessed, are more sightly to the eye, and consequently more marketable, than the English; but it is likewise well known, that much artifice is used in rasping, colouring, and other manœuvres, to render them such. By these methods their outward appearance is so much improved as easily to impose on our senses, and even to induce some eminent druggists to consider them as greatly preferable to the English. But it behoves the faculty to examine whether rhubarb may not acquire some noxious quality from the colouring substance employed, and whether the griping effects so frequently complained of, may not sometimes proceed from the *Dutch yellow*, extracted from buckthorn berries, with which the root is commonly coloured.

The art of disguising, and variously sophisticating drugs, is now become a science; and the dangerous consequences resulting from this pernicious practice call aloud for the interposition of the legislature.

The foreign rhubarb may be supposed to acquire some advantages from soil, climate, culture, and the mode of drying; but much more, I apprehend, from its superior age. The root has not been cultivated in this climate till within these few years; whereas the foreign rhubarb, according

according to the testimony of the learned Professor BERGIUS, is not taken up till it is eleven or twelve years old, which alone may perhaps be found sufficient to constitute the difference. This circumstance at least seems to deserve future inquiry. In the interim, let us endeavour to ascertain their comparative virtues.

With respect to the specimens of English rhubarb No. I. and No. II. which were lately committed to my examination by our worthy Secretary, I have hitherto only had opportunity of making the following trials. The shrivelled scabrous appearance of these specimens seems to denote some material defect to have taken place in the article of drying and curing the roots, which can only be learnt by experience.

It may not be improper to hint, that all the larger roots ought to be perforated through the centre, this part of the plant being the most liable to decay, and the process of drying ought to be performed with expedition. The proper degree of heat may be ascertained by dint of observation, and adjusted with accuracy by the thermometer.

EXPERIMENT I. Four tinctures were drawn by macerating Turkey, East-Indian, and the English rhubarbs No. I. and II. of each half a drachm in an ounce of proof spirit, in four separate vials, for three days. The tinctures, being strained and filtered, appeared nearly similar as to smell and colour, only the two former seemed rather more astringent and aromatic to the taste.

EXP. II. To sixty drops of each of these tinctures, was added a single drop of a solution of salt of steel in a small glass. The two tinctures of foreign rhubarb almost instantly assumed a dusky green, inclining to black, while the tinctures of the English rhubarb only acquired a darkish brown colour.

EXP. III.

Exp. III. To each of the above tinctures were now added five drops more of the chalybeate solution; when the Turkey and East-Indian tinctures became considerably more black, particularly the former. The tincture of the English rhubarb acquired a deeper brown, particularly No. I. but by no means equal to the tincture of the Turkey rhubarb.

Exp. IV. To illustrate this more clearly, the four mixtures were used as ink, and the names of each were written with them separately on writing paper, which paper is inclosed, and accompanies the four tinctures for the Society's inspection.

Exp. V. To a stout young man, who was troubled with a painful ulcer in his leg, were given 60 grains of the powder of East-Indian rhubarb, with the usual regimen: it operated only twice.

Exp. VI. At the interval of forty-eight hours, he took the same quantity of English rhubarb No. I.: this operated four times,

Exp. VII. At the like interval, he took the same quantity of English rhubarb No. II. which operated briskly three times.

Exp. VIII. Lastly, he took of Turkey rhubarb only forty-five grains, which however operated four times, though less briskly than the English. All of them tinged the urine alike, and operated without occasioning any nausea, sickness, or gripes.

R E M A R K S.

It has already been observed, that the tincture of the Turkey rhubarb tasted rather more aromatic than the rest; and from Experiments I. II. III. and IV. it would appear, that it possesses a somewhat higher degree of astringency than the East-Indian; and that this rather exceeds the two English tinctures as to the astringent quality. For it is the known property of salt of steel, or copperas, to strike a black colour with astringents, and that in proportion to the degree

degree of astringency; hence the superiority of galls as an ingredient in ink, being one of the strongest astringent vegetables hitherto discovered.

From Experiment V. it would appear, that the East-Indian rhubarb is actually a weaker purgative than any of the rest; and yet this is the drug which is by far most commonly used, in the shops especially, for making the tincture.

From Experiments VI. and VII. we see that the English rhubarb, especially No. I. possesses the purgative power in a superior degree.

From the VIIIth Experiment it appears, that forty-five grains of the Turkey rhubarb contain the purgative quality, nearly equal to sixty of the English, or in other words, that the English rhubarb requires to be given to the amount of about one-fourth more, to produce the same effect. This coincides very nearly with the result of some former trials which were made some years ago, before the English plant had acquired sufficient growth: but some later experiments evince, that it approaches nearer and nearer to the foreign rhubarb in proportion to its age. On the whole, I think it is evident, that the culture of rhubarb in this country ought not to be discouraged, or the efficacy of the English plant contemned, till it has undergone a fair and candid trial. But on the contrary, various circumstances evince, that it deserves farther encouragement, and farther investigation; by which there seems much reason to believe, that, in process of time, we may be enabled not only to supply a sufficient quantity of the genuine drug properly cured for home consumption, but also for foreign markets. Many valuable exotics, after being inured to our climate, thrive surprisingly, and at length become indigenous.

Thus

Thus the English saffron is now acknowledged greatly to surpass that of Spain and other countries; the assafoetida plant, though a native of Persia, now flourishes in the botanic garden at Edinburgh; and it is to be hoped, that in time, the English rhubarb, which already rivals the East-Indian, may, by due attention, be brought to equal that of Russia or Turkey.

BATH, Dec. 11, 1784.

Observations and Experiments on the comparative Virtues of the Roots and Seeds of Rhubarb; wherein some singular Properties of their Residua (after aqueous or spirituous Tinctures had been extracted from them) are discovered.

[By the SAME.]

Nil intentatum linquere. MART.

GENTLEMEN,

I SUBMIT to your consideration the following additional experiments, as a supplement to my late paper on rhubarb.

Being desirous to know whether the four different kinds of rhubarb, mentioned in my last, retained any purgative quality after the tinctures were drawn from them by proof spirit, I made the following experiments:—

EXPERIMENT I. Thirty grains of the residuum of the Turkey rhubarb were given in two ounces of spring water to the same
young

young person who took the powder, and with the same regimen. I was not a little surprised, however, when he informed me that it operated three times, and that almost as briskly as thirty grains of the same rhubarb had done a few days before, when given in powder,

Exp. II. At the interval of three days, he took the like quantity of the residuum of the English rhubarb No. I. This operated three times, and almost as freely as thirty grains of the powder of the same No. I. had done before.

Exp. III. At the like interval he took the residuum of the English rhubarb No. II. which also operated three times.

Exp. IV. At the farther interval of three days, the residuum of the East-Indian rhubarb was administered, but without producing any sensible operation. He experienced no sickness, nausea, or griping, from any of the above doses. The small ulcers in his leg had gradually assumed a better aspect, and were now entirely healed, though no other medicine had been taken.

Exp. V. To a healthy person, in the prime of life, were given, at due intervals between each dose, Turkey rhubarb, and English rhubarb No. I. and II. in powder, of each thirty grains. The two former operated only twice; the last operated three times very briskly. Each tinged the urine, the Turkey rhubarb most; No. II. the least.

Exp. VI. In order to determine whether the astringent quality of the rhubarb was intimately connected with the tinging property, so as to accompany it in the urinary secretion, ten drops of the chalybeate solution were added to a wine-glassful of the tinged urine on the several days that the above respective doses of rhubarb were taken; but no visible change of colour ensued.

Exp. VII. Towards the close of the year 1784, a robust woman, aged 46, who had for the last ten days laboured under an obstinate constipation of bowels, attended with frequent colick pains,

pains, flatulency, head-ache, and giddiness, took at my request of the powder of English rhubarb No. I. and II. in doses of thirty grains each alternately, every other night, till she had taken six doses. No. I. generally procured three easy motions: No. II. seldom occasioned more than two evacuations. The symptoms abated after the first dose, and finally disappeared before she had taken the fifth, and have never returned since, tho' no other remedy was administered.

EXP. VIII. Four tinctures were again drawn from the four different kinds of rhubarb, by macerating sixty grains of each in two ounces of proof spirit in separate phials for seven days. On filtering the tinctures, and drying the residua, it was found that the spirit had extracted forty grains from the Turkey rhubarb; thirty-seven grains from the East-Indian; thirty-two grains from the English rhubarb No. I.; and thirty-four grains from No. II. The residuum of each, however, still retained a considerable degree of astringency, as appeared from the inks which they yielded with the chalybeate solution. The characters written with them were indeed less black than in a former experiment; though sufficiently so to mark out the astringent quality. The Turkey rhubarb give the darkest shade; the English No. II. the lightest.

EXP. IX. To a healthy middle-aged person, were given, at suitable intervals, in a glass of spring water, the residua of each of the tinctures alternately with an equal weight of the different rhubarb in powder; when it was again found, that the residua of each operated very nearly as much as the several powders; except that of the East-Indian, which had no sensible operation, while the powder of the same root operated twice. The residua likewise evidently tinged the urine, and proved diuretic, even before their cathartic operation commenced.

EXP. X. Since writing the above, Mr. THOMAS DAVIS, late an ingenious apothecary at Bradford, to whom I had recommended some experiments with English rhubarb No. I. favoured me with the following account:—

“ The

“The English rhubarb greatly exceeded my expectations; I gave it to a patient of a weakly habit, and found it operated both by stool and urine more powerfully than an equal quantity of the East-Indian rhubarb.”

In a subsequent letter, he adds, “I am now well convinced that the English rhubarb, after being infused in boiling water, cold lime water, or rectified spirits of wine, does not remain an inert mass destitute of virtue. I attended to the effects of these several preparations as closely as my time would admit, and having made the following experiments which you lately suggested, I shall now mention the result.

EXP. XI. “Having infused one drachm and a half of English rhubarb, in three ounces of boiling water, for twenty-four hours, and having strained, dried, and pulverized the residuum, I gave forty-five grains of it to a poor man in two ounces of peppermint water; it procured two loose stools in about five hours. In the evening he complained of griping pain of his bowels, with giddiness, and pain of the head and loins, which obliged him at six o'clock to go to bed. These symptoms increasing, I visited him at nine, and found his pulse full, and that he had passed at least a gallon of pale urine. Next morning I found him perfectly recovered.

EXP. XII. After infusing the same quantity forty-eight hours in three ounces of rectified spirit of wine, I gave the same person, at the interval of three days, fifty-five grains of the residuum. The urine after the second making was very pale, but not in so large a quantity as after the first dose. It gave him eight very brisk motions without griping him.

EXP. XIII. After infusing the like quantity in three ounces of cold lime water, I gave him, at the further interval of two days, fifty grains of the residuum. This procured only two stools, but as much urine as the first dose. Before it operated, he complained of severe pain, but it soon went off.” Thus far my correspondent.——

REMARKS.

REMARKS.

From Experiments I. II. III. and IX. it appears that the residuum of rhubarb, after a tincture has been extracted from it by proof spirit, instead of being reduced to a mere *caput mortuum* as has been commonly imagined, still retains its purgative quality in an eminent degree, except the East-India rhubarb, which (in Experiments IV. and IX.) seemed to have entirely lost it by maceration in the same menstruum.

EXP. VIII. shews, that proof spirit does not deprive either foreign or English rhubarb of their astringency.

From Exp. X. XI. XII. and XIII. it further appears, that the English rhubarb is not divested of its purgative or diuretic power, by boiling water, rectified spirit of wine, or lime-water; and that the griping quality which rhubarb exerts in certain constitutions, seems to be increased by a watery menstruum. The giddiness and other symptoms being so remote from its usual operation, ought rather to be attributed to peculiarity of constitution, or other adventitious circumstances.

From Experiments V. and X. where the different powders were given in substance without any tincture being drawn from them, the purgative effects of the English seemed to be at least equal, if not superior, to those of the foreign rhubarbs. The result of these experiments being somewhat different from some of the preceding ones, must be referred to difference of constitution in the persons who took similar doses.

Experiment VI. Here the well-known property of rhubarb in tinging the urine of a yellow colour (even before its purgative operation takes place) shews the extreme
subtlety

subtily of this portion of the drug in pervading the finer series of vessels; and its retaining this tinging property so tenaciously in Experiment IX. after a tincture had been drawn from it by ardent spirits, nay, even after circulating with various animal fluids, seems to point out, that, were it not for the high price it bears, rhubarb might be turned to good account as a colouring substance. Its yellow colour resists aquafortis, and other acids, which destroy the colour of infusions of saffron, turmeric, and other vegetable yellows.

From this experiment we further learn, that the tinging property is distinct from the astringent quality, since the urine, though deeply tinged with it, communicated no visible blackness to a solution of martial vitriol, which it would not have failed to have done, had the urine contained any astringent impregnation. The astringent quality of this drug, therefore, does not appear to enter the blood vessels, agreeably to what I have elsewhere remarked concerning the Peruvian bark.*

From Experiment VIII. it appears, that the two foreign rhubarbs yield more soluble parts to proof spirit, than either of the English, and that of the latter No. II. rather surpasses No. I. in this respect. But it is evident from the subsequent experiments, that the purgative power of rhubarb does not keep pace with its solubility in ardent spirits, because the residuum, which remains insoluble in that menstruum, yet retains the purgative virtue; and the East-Indian, though more soluble, is yet less purgative than the English. It is remarkable, that the spirituous extract of rhubarb does not purge, but that the extract made by water after spirit does; as if the purgative quality resided chiefly in a combination of gummy and saline matter.

* In my second letter to Dr. SAUNDERS, on the red Peruvian bark.

The nauseous taste of rhubarb seems to arise from a sweet combined with a bitter, and affords room to believe, that it contains a saccharine matter, which probably might be obtained in a separate state by a suitable chemical process. Accordingly, I find the celebrated M. SHERLE, a German chemist, is said lately to have succeeded in obtaining from it a salt consisting of the saccharine acid united to an earth; and M. MODEL asserts, that rhubarb contains this selenetic matter to the amount of one-tenth of its weight.

How imperfect is our knowledge concerning the constituent parts of vegetables, and even of those vegetables with which we are the most familiar! Whence it would seem advisable, in order to have their virtues entire, that we should give them in substance, the form in which nature presents them, rather than in infusion or tincture. This at least seems evident with respect to the drug now under consideration.

My learned Friend the DEAN of GLOCESTER, in a late conversation on this subject, having dropt a hint that the seeds of rhubarb might probably deserve attention, I was determined to try them. Accordingly Mr. RACK favoured me with a little parcel, of the same age as the roots of the English rhubarb, (viz. four years old) though not the produce of the same plants.

EXPERIMENT XIV. Twelve grains of the seeds reduced to powder, were given to a woman of fifty years of age in a glass of plain water. The powder caused a slight nausea, and sickness attended with gripes, and afterwards operated briskly three times.

EXP. XV. The same quantity given to a middle-aged man, operated twice without producing these symptoms. The same person two days after took twenty grains, which operated four times in a gentle, easy manner.

EXP. XVI. A tincture was then drawn from sixty grains of the seeds in two ounces of proof spirits. On filtering the tincture, it was found that the spirit had extracted only ten grains from the seeds; for the residuum left in the filter, when dried, weighed forty grains.

EXP. XVII. This tincture possessed the taste, and other properties of rhubarb, and its aromatic quality was more predominant than in any of the tinctures drawn from the root. The astringent property, however, was manifestly less; for on adding the usual quantity of a solution of martial vitriol, and writing with it, the ink appeared rather weaker, even than that of the residuum prepared from the root.

EXP. XVIII. Twenty grains of the powder of the seeds were given to another person of middle age, which operated briskly three times; the urine in this, as well as the former cases, was very slightly coloured. At the interval of two days, this experiment was repeated with the same effect.

EXP. XIX. The same person, at the like interval, took twenty grains of the residuum of the above-mentioned tincture, which operated also three times; but more gently than the powder.

EXP. XX. This experiment was likewise repeated within three days, and with similar effect on another person.

R E M A R K S.

From these experiments it appears,

1st. That twelve grains of the seeds operate on some persons nearly as much as twenty on others, though of the same age. On some, they act gently; on others, more roughly: such is the difference of constitution. Hence the necessity of repeating the experiments on several subjects, before the effects of this or any other drug can be satisfactorily ascertained. In general, it would seem to appear
that

that twenty grains of the seeds are adequate to thirty of the root, as to the purgative power.

2dly. That the residuum of the seeds is nearly equal in this respect to their powder, according to what was discovered concerning the residuum of the root; but here the proof spirit extracted less from the seeds, than from the root by way of tincture.

3dly. That the seeds appear to be more aromatic than the root, but to contain less astringency than even its residuum, when treated in the same manner.

Some writers alledge, that the distilled water of rhubarb contains a purgative quality. But this merits farther confirmation, and at the same time suggests some additional experiments to those whose curiosity may prompt them to prosecute the subject, which is still far from being exhausted. The chemical and medicinal properties of the distilled water, and of the residuum; the elastic fluid extricated by distillation; the essential salt, and the astringent principle, may all afford further novelties worthy the attention of a curious observer, and perhaps throw new light on the hidden qualities of this important drug.

I have the honour to be, &c.

A. FOTHERGILL.

BATH, Feb. 10, 1785.



Opinions on the Virtues and Quality of the English Rhubarbs, in Letters from different Medical Gentlemen.

L E T T E R I.

[From J. C. LETTSOM, F. R. S. and S. A.]

SIR,

THE roots of rheum palmatum sent to me from Bath I carefully examined: in colour and grain they resembled the best Turkey rhubarb in the shops, with the same grittiness and taste in chewing; but with the difference of being more mucilaginous, probably owing to the circumstances of age and degree of dryness. In these respects, however, I could not clearly discover any difference in the two specimens. They were carefully dried and powdered, with a view to ascertain their medicinal qualities from experiment.

By the occasional use of Turkey rhubarb, I had pretty well acquired the knowledge of its operation on myself, in a dose of ten grains, which affords one evacuation. I took ten grains of the specimen marked No. I. and so far as I could judge, the effect was precisely what I might expect from the same quantity of Turkey rhubarb.

About a week afterwards, I purposed to take the same dose of the specimen marked No. II. but some circumstances of immediate attention having occurred, I did not execute my attention. On that night, however, I suffered an unusual degree of pain of the abdomen, without knowing any cause for such an event, having enjoyed for many preceding months, as well as since, the most uninterrupted health.

I mention

I mention this circumstance to shew, how cautious we ought to be in drawing conclusions from a solitary fact; for had I taken the rhubarb as first proposed, I might have ascribed the unusual pain to this vegetable.

On the subsequent night I took it: it excited no pain or inconvenience, and produced an effect, though less than from No. I. I do not hence conclude, that No. II. was weaker, for whatever purgative medicine we give, it is observable, that the first dose acts more powerfully than the subsequent ones, either from habit diminishing the stimulus, or from lessordes remaining after the first exhibition of such remedies; as snuff by use loses its stimulus on the olfactory nerves.

It might seem a very natural inference, that a medical person is the best judge of the effects of medicine, by experiments made on himself; but this may be doubted, as his imagination may be more forcibly directed to fancy those effects, which its knowledge induces him to suspect. We have remarkable proofs in point, in many medical books, whose authors have related effects of remedies, which none but themselves could discover. To explain this by a recent instance: the late celebrated Dr. STORCK, who wrote upon the diuretic effects of the *Colchicum Autumnale*, fancied he could feel its stimulus on the secretory organs of urine, and its almost immediate increase of that secretion; which numerous experiments since have clearly proved to have depended upon the ardour of imagination.

This led me to try the rhubarb, where imagination could not operate. I ordered it in about forty instances to children from one to three years of age; I never knew it to produce any griping that was perceptible; it answered as effectually, or nearly so, as the best Turkey, so far as I could

ascertain by particular attention and enquiry; as many of these trials were made on my own children. I conclude, however, that although the same effects were produced, the foreign vegetable seems to be rather more active than the English *rheum palmatum*, in perhaps the proportion of one-third at the utmost.

To sum up my opinion: I conclude, that the exotic plant possesses no one quality which the other does not contain; that they are the same production; and that, probably, the superior activity of the former may depend on circumstances of soil, time of taking up the roots, their age, and the methods of drying, which future enquiries may doubtless determine.

From some observations that have occurred to me, I suspect that young plants have more mucilage, and less of an active resin, than old ones; but at what particular period to fix the properest age for medicinal use, my observations do not warrant me to decide.

With regard to the two specimens of the English *rheum palmatum* marked No. I. and II. I find it difficult to give the preference. I rather prefer, however, that marked No. I.

J. C. LETTSOM.

LONDON, Oct. 29, 1784.



L E T T E R II.

[From Dr. HOPE, Edinburgh.]

SIR,

THIS day I received your letter of the 11th of March, with two parcels of rhubarb.

Your learned and well-informed Society know, that the rhubarb which we receive through Russia, formerly called the Turkey rhubarb, is the root of the rheum palmatum, and different from the rhubarb received from China: we have been in possession of this species of rhubarb above twenty years.

Most of the apothecaries here use no other than what is raised in Scotland. For several years there has been no other used in the Royal Infirmary. *When a sound root of this is well dried, and properly dressed, it is in no respect inferior to what comes from Russia.* The point therefore before me is, the state of preservation of the two parcels sent, of which I shall give you my opinion without reserve.

I beg leave to premise, that as your letter is dated the 11th of March, the roots, from having lain in damp places, and from other causes, may have suffered.

The parcel No. I. consisted of two pieces of roots of a moderate size. I cut each into four parts, by cross incisions; one of them was the crown of the root, and evidently unsound in the heart, though not to any great degree; the other was sound throughout.

No. II. consisted of a small branch, which was soft, flexible, and not sufficiently dried, and of a larger piece of the body
of

of the root. Upon cutting it into four pieces, I was sorry to find it unsound in the heart; in place of its natural beautiful nutmeg or marbled appearance, I found it brown, and slightly tinged with black, and softish in the heart; the rest of this piece was found and good, except a little under the bark, which was discoloured. None of the four pieces were externally dressed, and therefore not marketable.

Although No. I. seemed to me to be more fully dried, and better dried, than No. II. it would be rash to extend this opinion to the rest of the parcels. It is proper to add, that none of the pieces were so unsound, as, in my opinion, to injure their medicinal qualities: but three of the four pieces would not keep; the moisture and unsoundness would have extended, and spoiled more of the root.

On the subject of rhubarb, I have thought much, and made many experiments, and received much useful information: after all, it is a very difficult and uncertain attempt to dry rhubarb successfully.

It gives me great pleasure to see Societies of Agriculture established in different parts of England. If I thought it would be acceptable to your Society, I should transmit to you what a long experience has taught me. Would it be acceptable to the Society to have a few seeds of the *asafœtida* plant, which is hardy? There are but four plants of it in Europe: two in this garden, and two in the King's garden at Kew, from seeds which I sent Mr. AYTON two years ago.

I am, Sir, your obedient servant,

JOHN HOPE.

P. S. As

P. S. As the Society seem desirous to have the opinion of the best judges of home rhubarb, on the parcels claiming the premium, I transmitted the two parcels you sent me to Sir ALEXANDER DICK, and send inclosed his answer.

EDINBURGH, *July 17, 1784.*

L E T T E R III.

[From Sir ALEXANDER DICK, to Dr. HOPE.]

DEAR DOCTOR,

I Got your letter, and specimens of the rhubarb, with the Gentleman of Bath's letter to you, by your servant, yesterday; and as I would not delay an answer to you in a matter of such consequence as my favourite subject of the true rhubarb's cultivation in Britain, and my thoughts of these two specimens sent you from Bath; I offer you my thoughts frankly, as to a brother of the College, though a superior judge in this matter to myself.

I indeed think neither of the two specimens you sent me are correctly dried, nor cured to advantage, either for medicinal uses, or commerce. You do not see prevailing over the pieces you sent me, the nutmeg-looking grain in these roots, such as has a similarity to the colour of the flower of the plant when in its perfection, which I ascribe either to the roots not being of sufficient age; (that is, five or six years at least) or what my gardener (the bearer) suspects, the roots have been too gradually dried, and not in a place sufficiently well aired and warm in a proper degree, consequently

frequently have suffered by some damp and mouldiness. He brings for your inspection some pieces of mine, five or six years old, and some of last year's drying, and some which the Society of Arts in London returned of mine, trimmed by their order, and approved of.

I ever am, yours,

ALEXANDER DICK.

PRESTONFIELD, *July* 20, 1784.

E E T T E R IV.

[From Dr. CUMING, Dorchester, to the Secretary.]

SIR,

ABOUT the 26th of March last, I was favoured with your letter of the 10th of the same month, accompanying two specimens of rhubarb root of British growth, and requesting my opinion, upon trial, of its qualities and efficacy, compared with that imported from Turkey.

That I might be able to give the Society some information, and likewise to satisfy myself as to its comparative merit, I immediately distributed small parcels of what you sent me to some apothecaries in this place, distinguishing them by No. I. and No. II. as you had done; I also sent a piece of each sort to an eminent physician in this county. The accounts from the apothecaries are too vague and uncertain to be repeated, as the trials were not made with sufficient accuracy: but I am informed by my friend the physician, that he gave a piece of No. I. to a lady, who was in
the

the practice of chewing rhubarb occasionally; she reported to him, that she found it answer perfectly well, and in the same dose as that which she had from the shops. The trial which I made upon myself was, I think, not quite so favourable, as it required three parts of No. I. to produce the same effect on me, as two parts of the Turkey rhubarb usually did, though they both operated with equal ease; and No. II. I think is inferior in strength to No. I.

I am sorry, Sir, to be obliged to send you an account so lame and unsatisfactory, yet it is the best that I can at present furnish. I hope you will receive more decisive intelligence from the numerous practitioners at Bath, and shall be glad to learn that the efficacy of British rhubarb is found to be equal to that from Turkey.

I had a rhubarb root sent me last autumn, said to be that of the *rheum palmatum*, but was greatly disappointed by seeing it, in the spring or beginning of summer, shoot out large, round, entire leaves, similar to those of the *raponticum*, which I believe it to be. Can you inform me if the leaves of the *rheum palmatum* are digitated or palmated, the very first year after being transplanted? Or may we expect that these entire round leaves will in a succeeding year assume a palmated form?

With my sincere wishes for the prosperity of the Society, and for the continuance of your health,

I remain, Sir,

Your obedient humble servant,

W. CUMING.

DORCHESTER, Aug. 14, 1784.

LETTER

L E T T E R V.

[From Messrs. CLARKE, JACAM, and CLARKE, Druggists, in London.]

SIR,

WE have deferred giving you our opinion on the two specimens of rhubarb sent to us by the Bath Society, wishing to join some physical observations to our own as druggists, thinking it a subject that required much nicety and attention.

The specimen No. I. appears to be not of the true rhubarb; it abounds more in gummy matter than refinous, therefore, as a purgative, is much weaker than either the Indian, Russian, or Scotch. Its texture is more lax and spongy than any rhubarb we ever saw, and its colour lighter. The grain in some parts is beautiful; but it does not communicate to the taste that warmth and bitterness which is always found in the other rhubarbs. Its smell is very singular, not in the least resembling rhubarb; it is besides imperfectly dried. It has been given in the usual quantity of a dose without any sensible effect.

The specimen No. II. appears to be of the true rhubarb, but we think not produced from the Russian seed. Its smell, taste, and effect, correspond in some degree with the foreign rhubarbs, only it is weaker, and the grain very indifferent. This has also been imperfectly cured, and we apprehend not taken up at a proper age. Of the two specimens, we certainly give the preference to this, though think it inferior to the foreign rhubarbs.

We

We have sent for your inspection two specimens of some raised in Scotland on the estate of the Duke of Athol, which are produced from the *true* Siberian seed. The Duke sent us some the same as the specimen No. II. last year, upon which we took the opinion of some gentlemen of the first eminence in the profession, (the same with whom we have consulted respecting yours;) they agreed, that it was nearly if not quite equal to the Russian, in smell, taste, and effect, but thought, by paying a little more attention to the curing of it, its beauty might be increased. We presented this to the Duke, and he has now sent us a specimen (of which No. I. is a part) of what we are to have in future. As yet we have not received any of it for sale; but of No. II. have sold a large quantity, which has been generally approved by the gentlemen who have used it.

We hope this account will prove satisfactory to the Gentlemen of the Society: should they wish any further trials to be made, and can favour us with any larger specimens, we will get them used in every form of pharmacy, and the different menstrua.

We shall always be ready to give the Gentlemen our sentiments on any subject that may come before them, which relates to our line of business.

We have the honour to remain, Sir,

Your obedient humble servants,

CLARKE, JACAM, and CLARKE.

LONDON, *May* 1, 1784.

LETTER

L E T T E R VI.

[From Mr. R. C. SIMS, Dunmow, Essex.]

TO investigate the medical properties and powers of rhubarb of English growth, and to determine the proportion of its strength to that of the Turkey and East-Indian sort, with any degree of accuracy, is a nice and difficult point. It requires the consideration of the differences which may occur in the specimens themselves, in the constitution and present state of the stomach and bowels of the persons taking it, and in the season, and other incidental causes of difference. Many of these circumstances are obscure enough to escape or baffle the observation of a diligent enquirer; and yet so efficacious in changing and determining the medical powers of a medicine, as to cause the same drug to produce very different effects in different persons, or even in the same person on different trials; and at another time to cause two drugs, of different medical powers, to produce effects nearly similar: therefore nothing less than a variety of different trials, repeated by different persons for a length of time, can establish certainty in this case. It would be wrong to amuse with crude experiments. Therefore all I can now say is, that the sample No. I. appears the best of the two, and to resemble the foreign in colour, flavour, and grain, more than No. II.

Both samples consist of a larger and a smaller piece: the larger cut flat, and the smaller cylindrical, or a fragment. A drachm of each piece, and of Turkey, and good East-Indian rhubarb, each fresh powdered, and placed on a separate piece of paper, ranged, when compared with respect to deepness of colour, in the following order: 1st, The flat piece of No. II. by far the palest. 2d, The cylindrical

lindrical piece of the same sample, much higher coloured.
 3d, The cylindrical piece of No. I. 4th, East-Indian.
 5th, The flat piece of No. I. 6th, Turkey, the deepest
 yellow of any.

The rhubarb taste and astringency of the samples seemed proportioned to the colour. The flat piece of No. II. cut very pale; and in powder was not yellower than the powder of the flat piece of No. I. when ground with double its weight of starch. Infused cold, it gave very little colour to water, but to proof spirit a colour equal to that of the flat piece of No. I. At the same time the cylindrical piece of the same sample No. II. gave both to water and proof spirit a higher tincture than even the flat piece of No. I. or either of the foreign rhubarbs. I am not qualified to speak of the comparative strength of the medical powers of English and of foreign rhubarb: Nor do I know of any quality in the English that is inimical to health.

From the examination I have made of this rhubarb, I have no reason to apprehend any bad effect from its use: But my experience is not sufficient to warrant me to think it right to administer it in the general course of my practice. In all delicate cases, experiments ought to be made with the greatest caution, and even jealousy.

R. C. SIMS.

DUNMOW, 13th of the 8th Month, 1784.

